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DISSERTATION

Effects of Deployments on Spouses of Military Personnel

Bogdan Savych

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Abstract

Over 1,000,000 service members were deployed away from their families in the first 5 years since the start of the U.S. military campaign in Afghanistan and Iraq, and over 350,000 service members experienced two or more deployments. Although deployments disrupt the contribution of service members to household production, little evidence exist about the effect of deployments on spouses. This dissertation examines an effect of deployment on spousal labor force participation and household wellbeing. Combining administrative pay records with responses to surveys of active duty personnel, I find that deployment reduces spousal labor force participation by 2.8 percentage points. This reaction varies by the age of the youngest child in the family. Deployment reduces spousal labor force participation by 4.9 percentage points in families with children under age 6. I also find that spouses decrease their labor force participation several months before service members are actually deployed, and return to the labor force several months after service members return from deployment. I also find that deployment increases reenlistment rates. Those soldiers who were deployed since September 11, 2001 are more likely to stay in the military at the end of their contract. I also find evidence of the selective separation from the military based on the spousal taste for employment. Those spouses who have a high taste for a career and perceive that military life may impose constraints on their job opportunities encourage service members to leave the military.

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Chapter 1

Introduction

This dissertation examines the effects of deployments on families of active duty military personnel. In the first 5 years since the start of the U.S. military campaign in Afghanistan and Iraq, over 1,000,000 service members were deployed away from their families at least once, and over 350,000 service members experienced two or more deployments.[1] When deployed, service members often spend months away from their families, with a median deployment length across all services of just over 7 months in 2005, and a median deployment length in the Army of just under 12 months.[2] Since the majority of soldiers today— about 56 percent of enlisted personnel and 74 percent of active duty officers—are married, deployments affect not only service members but their families. While the sacrifices of service members are widely acknowledged, we know relatively little about the effects of military demands on families of military personnel. This dissertation focuses on the effects of active duty personnel deployments on spousal labor force participation and household wellbeing.

This research examines the following questions:

- Does deployment of active duty personnel affect spousal labor supply?

- Does deployment affect household wellbeing?

- Do these effects depend on household and deployment characteristics?

Deployment effect helps us understand how a household responds to an unanticipated

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[1] Over 2,400,000 service members served on active duty between 2001 and 2006.

[2] Estimated from the Global War on Terrorism file maintained by the Defense Manpower Data Center.

temporary shock that affects soldiers' earnings and time at home. Since deployment removes a service member from the household and from household production, the spouse may need to change his or her allocation of time to home work and paid employment. Spouses remaining at home must shoulder an increased burden of household duties, including maintaining the household, taking care of sick relatives, and providing child care. Depending on the relative productivity of the spouse in the labor market versus in household duties, he or she may drop out of labor force to deal with increased household demands, or hire additional help with household duties. Deployments also lead to higher earnings for military personnel. Assuming that leisure is a normal good, an increase in household income would reduce spousal labor supply and increase consumption of leisure.

In addition to shedding light on how deployment shocks affect household outcomes, understanding the effects of deployment on spousal labor force participation is important to policy makers who are concerned with the wellbeing of military families. In the age of an all-volunteer force, the decision of a service member to remain in the military may be influenced by how family members view their life in the military. If a service member believes that frequent and lengthy deployments constrain employment opportunities of the spouse and family wellbeing, he or she may be less inclined to stay on active duty for another term, thus affecting the ability of the military to support future manning levels. Much of this effect depends on whether families anticipated deployments before they joined the military. Although many service members anticipate spending some time away from home for military duties, the long and frequent deployments in support of operations in Afghanistan and Iraq were not anticipated at the time of selection into military life before the start of the military campaign.

This analysis also helps us understand how military life may compromise spousal career opportunities. While previous studies find that military spouses have worse labor force outcomes than comparable spouses of civilian workers,[3] these studies ignore possibility that the difference may be due to the difference in time that service members spend away from home on their duties. I consider constraints that were overlooked in the previous studies by examining how time away from home for deployment affects spouses.

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[3]Military spouses are less likely to be in labor force, less likely to work full time, work few hours per week and fewer weeks per year, and earn lower wages than civilian spouses with the same age and education level (Hosek et al., 2002; Wardynski, 2000; Harrell et al., 2004; Cooke and Speirs, 2005)

The goal of this dissertation is to examine how deployment affects spouses of the active duty personnel. As part of this research I first provide background information necessary for understanding the role of deployments in military life. In Chapter 2 of this dissertation I suggest that current empirical literature pays limited attention to the time that service members spend away from home. In particular, the research that compares labor market outcomes of military and civilian spouses ignores the differences in time commitments of service members and civilian workers. This is surprising since service members often spend more time away from home than workers in many other occupations. Military personnel are often away from home for deployments, individual or unit training, or overtime work at the base. I also provide background information on military policies that are associated with deployments.

In Chapter 3, I discuss theoretical effects of deployment on spousal labor supply and household wellbeing. As part of the analysis, I provide a framework that treats service member's time away from home as a factor in a household decision making process. I use this model to derive theoretical predictions about the effects of deployment on spousal labor supply and family wellbeing. I also explain the predictions from the model drawing on the findings in existing literature from multiple disciplines.

Chapter 4 describes data and measures used in my analysis. I obtain information about spousal labor force participation from surveys of active duty personnel conducted between 2002 and 2005. Then, I link these surveys to administrative records. These administrative records provide detailed characteristics of each service member, history of deployments, and service members' retention behavior.

In chapter 5 of this dissertation I test predictions from the household labor supply model by examining how deployment affects labor force participation of the spouses of active duty personnel. I find that deployment decreases spousal labor force participation by 2.8 percentage points. I also find that this effect varies by household and deployment characteristics. First, I find that spouses react differently to service members' deployments when there are young children in the household. Deployments have the largest effect on spouses in families with children under age 6. The labor force participation of these spouses declines by 4.9 percentage points when the service member is away from home on deployment. In families where the youngest child is over age 12, the effect of deployment is positive, although not

statistically significantly different from zero at the 95 percent confidence level. Second, I find that spouses react to long deployments. While the effect of deployments under 4 months is not statistically different from zero, the effect of deployments over 5 months is negative and statistically significant. Furthermore, I find that spouses change their labor supply before deployment actually happens. In particular, spouses reduce their labor force participation 2 to 3 months before actual deployment and this effect holds through the end of the deployment period. After service members return from deployment the effect gradually disappears, although it takes spouses several months to return to the labor force.

Chapter 6 of this dissertation examines the effect of deployment on household wellbeing. I use service members' retention intentions and reenlistment behavior as measures of the household wellbeing. These measures reveal whether a family expects to improve its wellbeing by leaving the military, since those families that are negatively affected by deployment should be more likely to leave the service. Consistent with the previous findings in Hosek et al. (2006), I find no effect of deployments on service members' intentions to stay in the military. Furthermore, my analysis suggests a positive relationship between deployment and reenlistments: those service members who were deployed to wars in Afghanistan and Iraq were about 4 percentage points less likely to leave the military once their enlistment contract expires. I also examine relationship between spousal employment and retention outcomes. The results suggest that the spousal employment is negatively correlated with reenlistment outcomes. In other words, service members are less likely to reenlist if their spouses are employed. I find that this relationship is driven mostly by the families in the first term of enlistment. This suggests that those spouses who feel that military life constraints their career and employment opportunities would be more likely to encourage service members leave the military when given a chance.

Chapter 7 of this dissertation revisits the evidence presented here and discusses it relevance to the policy making community. I also suggest directions for future research.

Chapter 2

Background for Examining Deployment Effects

This section provides research and policy background relevant for examining the effects of deployment on military families. First, I describe the role of families in the military. It is widely believed that spouses play an important role in soldiers' decision to leave the military. Spouses who are unhappy with military life may encourage service members to become a civilian family. Second, I review available literature on the employment outcomes of military spouses. The review suggests that even though military spouses may have worse labor outcomes than comparable civilian spouses, we can not attribute the difference to a causal effect of the military. In particular, the literature ignores the constraints on soldiers' time with the family. These time constraints include time on deployments, individual or unit training, and overtime work. I also describe institutional and policy environment related to deployments.

2.1 Role of Families in the Military

Families are an important part of military life. The majority of soldiers today—about 56 percent of enlisted personnel and 74 percent of active duty officers—are married, and of those who are married about 70 percent have children. As shown in Figure 2.1, half of active duty service members are married as they enter their fifth year in service, and over two thirds are married when they enter 10th year of service. Overall, active duty personnel

bring more than 1.9 million dependents into the military communities.[1]
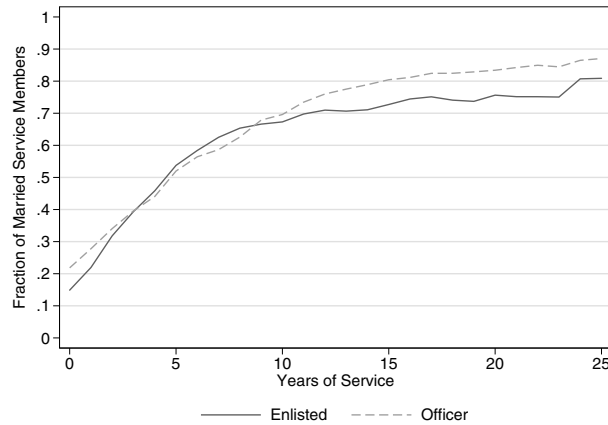
Figure 2.1: Fraction of Married Personnel by Year of Service.

Many researchers and policy makers realize that spouses may play an important role in soldiers' decision to remain in the military. During a recent testimony before the Senate Armed Services Subcommittee on Recruitment and Retention, LtGen H. P. Osman, USMC, pointed out that while recruitment is about personnel, retention is about families (Osman, 2005). Service members may consider the opinions of their spouses when deciding between staying in the military for another term or leaving the military. Research shows that service members are more likely to reenlist if their spouses support staying in the military (Orthner, 1990).

Policy makers are worried that the military may constrain spousal ability to develop their careers and may have negative effects on reenlistment behavior. Service members and their families are exposed to frequent moves, long deployments, long working hours, shift work, and risk of injury or death. These aspects of the military life may affect families and limit spousal ability to develop his or her own career. Furthermore, some researchers link spousal employment opportunities to their support for reenlistment. Those spouses who are not satisfied with their career opportunities while they are in the military may lobby service members to leave the force and become a civilian family. In particular, unemployed spouses are less likely to be satisfied with the military and more likely to encourage service members to leave the military (Wood (1988), cited in Orthner (1990)). Even though this evidence

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[1]Estimated from Defence Enrolment Eligibility Reporting System Files maintained by DMDC.

does not provide a causal effect of spousal employment on retention, many policymakers are concerned with the employment and wellbeing of military spouses.

2.2 Evidence About the Effects of Military Life on Spouses

Findings from qualitative studies suggest that the majority of military spouses believe that the military limits their employment and career opportunities. Almost two thirds of the military spouses interviewed by Castaneda and Harrell (2008) felt that being a military spouse constrained their work and career opportunities. They suggest that the main reasons for this negative effect were frequent and disruptive moves, service members' absence (e.g., deployment, temporary additional duty or temporary duty [TAD/TDY], and training), difficulty finding child care, and employer bias against or stigmatization of military spouses.

Evidence suggests that military spouses have worse labor market outcomes than comparable civilian spouses. For example, military spouses are less likely to work in a year, and less likely to work full time than the comparable spouses of civilian workers (Hosek et al., 2002; Wardynski, 2000; Harrell et al., 2004; Cooke and Speirs, 2005). Furthermore, those military spouses who work earn lower wages than their civilian counterparts. Hosek et al. (2002) estimate the wage gap for young high-school educated wives to be about $70 per week and about $90 per week for young college-educated wives. These differences persist in yearly earnings. Harrell et al. (2004) estimate that in 1990 annual income gaps ranged from $5,500 between Navy and civilian wives to $7,400 between Marine Corps and civilian wives. Hosek et al. (2002) estimate that over the 1987-1999 period, military family earnings averaged about $10,500 less than the earnings of civilian families. At least half of this difference comes from wife's earnings ($5,643).

Researchers are divided in their opinions on what these findings mean to policy makers. Some researchers believe that the observed cross-sectional differences in the labor force participation and the earnings of military and civilian spouses alone justify a policy intervention. Because the satisfaction of the military spouses may have an effect on personnel retention, the military has incentives to assure that military spouses have the job opportunities and earnings potential that they desire. In response to these findings, some policy makers support policies intended to improve the welfare and financial wellbeing of the mil-

itary families and spouses. The policies emphasize improving educational opportunities, career choices, childcare availability, and job search for spouses. They also include assistance in finding jobs, targeted job training, and agreements with local employers.[2] Other policy options include priority placement within the Department of Defense for relocated spouses, reciprocal certification agreements with other governmental entities, and internet-based employment websites.[3]

Other researchers believe that the observed differences in the outcomes of the military and civilian spouses may result from the efficient responses of the spouses to the constraints that they face. In particular, the differences in the labor force outcomes may simply represent the choices that spouses make to maximize family wellbeing (utility) under different constraints. Hosek et al. (2002) suggest that since service members often move from one location to another, the military spouses may differ from the civilian spouses in the way they search for jobs. As a result of the frequent moves, a military spouse is likely to accept a lower paying job, rather than continue searching for a better paying job, which is an efficient outcome that does not require a policy intervention. Military spouses may also place a large value on activities outside the labor market. They may receive satisfaction from volunteering and from participating in military wives group (social support network). These choices may reflect that the family have already decided to support the service member's career, and the spouse provides support by contributing to the social support network. Furthermore, military spouses may choose to work less because of subsidized health care, subsidized child care, and availability of recreational facilities on base. As a result, the observed differences in the labor market outcomes may reveal choices that spouses make to maximize their wellbeing. Thus, if the observed differences can be attributed to the differences in the optimal response behavior, then policy interventions are unwarranted.

Furthermore, researchers emphasize that available evidence can not attribute the observed differences in the labor market outcomes of civilian and military spouses to a causal effect of the military. Most of these studies use cross-sectional data and do not control for many unobserved characteristics of spouses and service members. For instance, these studies do not account for the possibility that military spouses are a very selected group

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[2]See, for example, Shellenbarger (2005).
[3]For description of the various state level policies and initiatives see http://www.ncsl.org/

of people, who may have different preferences for working than civilian spouses. Since the military may constraint spousal career opportunities, those spouses who have a high taste for work will be less likely to marry into the military. As a result, those people who become a military spouse may have a higher tolerance for the hardships that the military life imposes on families than those who do not marry into the military. Hence, the estimates do not prove or disprove a wide-spread belief that the military life causes the observed gaps in earnings and labor force participation. To prove the need for a policy intervention one have to show that the difference between the civilian and military spouses are truly caused by some aspects of the military life, and are not just driven by the unobserved characteristics of the spouses.

2.3 Constraints on the Soldiers' Time with the Family

This dissertation contributes to the policy discussion by exploring how service members' time commitments may affect spousal outcomes. My analysis recognizes that the military service may impose significant constraints on soldiers' time with the family. To achieve their operational goals the military may order soldiers to deploy to war zones, to participate in individual or unit level training away from home, or to work overtime. This may lead spouses to adopt labor force behavior which is different from the behavior of civilian spouses. Spouses may prefer flexible hours of work, part-time job, or may be willing to accept lower wages to receive desirable work schedules. Furthermore, recent increase in deployments has led to an unanticipated increase in the time that service members spend away from their families, which allows us to estimate a causal effect of deployments on spouses of active duty personnel.

2.3.1 Service Members Are Often Deployed to Dangerous Places

Operations in Afghanistan and Iraq has led to an unprecedented increase in the likelihood of deployments among Army and Marine Corps personnel. Fraction of the Army enlisted active duty personnel deployed to combat zone increased from 5 percent in 2000 to 25 percent in the first stages of the war in Iraq, and levelled at about 20 percent in 2004 and 2005 (see Panel A of Figure 2.2). Marine Corps personnel experienced a similar increase in the

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likelihood of deployments. It is important to note that the magnitude of these deployments were unlikely to be anticipated by most service member, thus deployments constitute an unanticipated shock to the time that service members spend with the family.

A. Fraction Deployed   **B. Median Deployment Length**
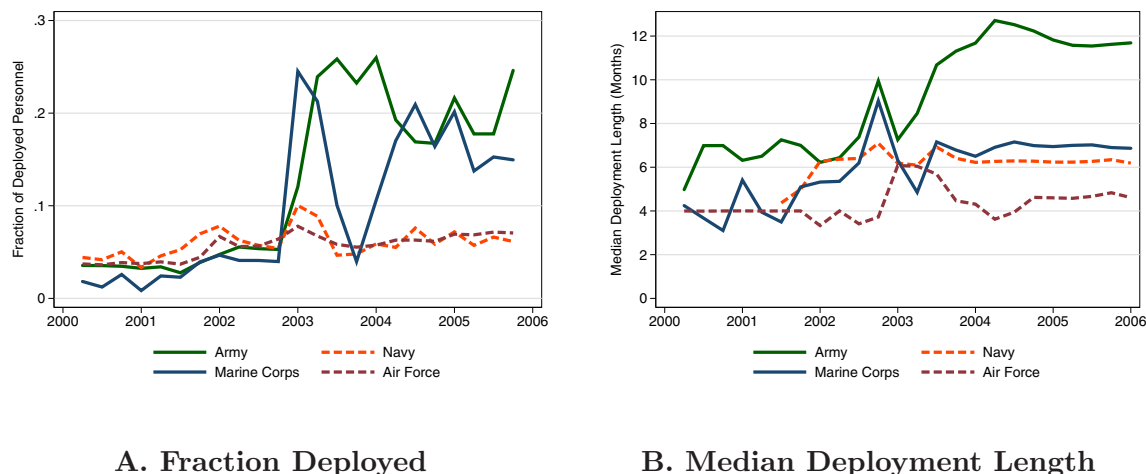
Figure 2.2: Fraction of Active Duty Enlisted Personnel on Hostile Deployment and Median Deployment Length, by Service

Deployments also lead to long separations from the family. Panel B of Figure 2.2 suggests that the median deployment length in Army in 2004-2005 was around 12 months. Furthermore, service members often experience repeated deployments. About 16 percent of service members who responded to the August 2004 survey of active duty personnel were deployed twice since September 2001, and another 12 percent were deployed three or more times (DMDC, 2004).

Recent deployments are likely to be exogenous to household characteristics. Most deployments occur on an individual or unit basis, and are determined by the needs of the military services to fill available positions in a specific occupational specialty. In the recent military campaign, the military had relied heavily on deploying whole units, thus all service members are likely to be deployed with their unit. Furthermore, the choice of units for deployment is driven by the demands of the military, not by characteristics of the spouses of military personnel, suggesting that deployments are likely to be exogenous to spousal outcomes. Although service members may know about upcoming deployment a few months to a year in advance, they have little control over whether, when, and for how long they are going to be away, and they can not avoid a deployment without serious consequences for

their career and possible criminal actions. In addition, the possibility of volunteering for deployments is very limited among active duty personnel.

Quantitative evidence from the first Gulf War suggests that deployments may reduce spousal employment. Angrist and Johnson (2000) find that deployments to the first Gulf War reduced spousal employment by 3.1 percentage points. It is not clear, however, whether these effects will hold for the most recent campaign since deployments are much longer.

2.3.2 Service Members Are Often Away from Home for Duties Other Than Deployment

Deployments to war zones are not the only reason why service members spend time away from their families. Soldiers often spend nights away from home for exercise, unit training, individual training, and temporary additional duty (TAD/TDY). Estimates in Table 2.1 suggest that these duties may have a large impact on the total time that service members have to spend away from their families. About 69 percent of all active duty service members who responded to November 2003 status of forces survey were away from home for reasons other than participation in the military operations in the last 12 months. On average, these service members spent over 2 months away from home and a median soldier spent 40 nights away from home in the last 12 months for reasons other than deployment to operations. These frequent work-related absences from home may have a large effect on families and spouses. A spouse should be ready to support his or her household when the service member has to perform duties away from the home base.

Table 2.1: Nights Away from Home by Type of Military Duty

Type of duty	Fraction with any night away (%)	Mean Nights Away	Median Nights Away
Operation	31	128	120
Exercise	24	37	21
Unit training	23	32	15
Mission support TAD/TDY	47	44	21
Individual training	16	30	15
Home station training	8	29	15
Duty in garrison	18	24	10
All but operation	69	68	40

Note: Mean and median nights away are estimated for those service member that spend at least one night away from home on each duty type. Source: Estimated from November 2003 Status of Forces Survey.

Table 2.2: Number of Times Worked Longer Than Usual Duty Day in the Past Twelve Months (Percent)

Times worked OT	Army Enlisted		Army Officer	
	Not away	Away	Not away	Away
0	8%	3%	7%	2%
1–10	18%	6%	10%	3%
11–20	13%	7%	9%	3%
21–60	26%	23%	24%	15%
61–120	14%	21%	18%	21%
> 120	20%	40%	32%	57%
	100%	100%	100%	100%

Source: Hosek et al. (2006, Table C.1)

2.3.3 Service Members Often Work Overtime

Even when service members are at their home base, they are unlikely to have usual nine-to-five jobs. Hosek et al. (2006) finds that service members often work long and irregular hours. On average, 32 percent of service members who responded to status of forces surveys in 2002 and 2003 have over 120 instances or working longer than usual hours in the 12 months prior to a survey. On average, about one in three active duty enlisted Army personnel and almost half of officers have 60 or more days on which they worked longer than usual duty day, even when not away (Table 2.2). Responses to the March 2003 survey of active duty personnel about primary reasons for working long hours suggest that the service members were very likely to work overtime because of high workload, and additional duties. Soldiers also reported working long hours because their unit was undermanned, or they were preparing for inspections (DMDC, 2003).

2.4 Compensation for Soldiers' Time Away from Home

Evidence from qualitative studies suggests several mechanisms for the effect of deployment on employment of spouses of active duty personnel. Spouses interviewed by Castaneda and Harrell (2008) mentioned that deployments, TDY/TAD absences, field training, and military work schedules have a negative effect on spousal work opportunity. Overall, about one-fourth of all spouses mentioned time that service member spend away from home for military duties as creating negative impact on their careers. Many spouses find it difficult to share parental responsibilities with service members, especially in dual career families. When service members are gone for military duties, spouses become single parents who need

to take care of all household duties by themselves. One spouse with college degree and four children interviewed by Castaneda and Harrell (2008) mentioned: "[Being a military spouse] has affected me greatly in being able to work a full-time job and maintain supervision for the children in his absence because he's gone a lot. We can't really depend on him as far as picking the kids up, making dinner, and things of that nature. So basically, I feel like I've been a single parent even though I'm married. And I think that's one of the biggest downfalls of being a military spouse. . . . You're the sole provider of everything."

A number of implicit and explicit reward mechanisms may compensate service members and their family members for soldiers' time away from home. Researchers emphasize that service members may receive intrinsic motivation from deployment experience. Service members interviewed by Hosek et al. (2006) mentioned that deployment provides an opportunity to use soldiers' training and preparation in real-world situations. Many service members join the military to fulfill a patriotic duty of defending their country and deployment allows them to contribute to this larger cause. They enjoy possibility to take on additional responsibility and to participate in challenging and fulfilling missions. "Focus group members reported that they derived a sense of fulfillment from their work on deployments that they did not get from conducting training exercises or daily work at home" (Hosek et al., 2006). The spouses may also have similar attitudes towards deployments.

The military also has a number of policies designed to help families and service members to cope with deployments. For instance, the Army's Well–Being program includes a range of support programs designed to help families and soldiers before, during and after deployments. These programs provide support to spouses, provide recreation for children, and provide medical support for families (McGuire, 2006). The military have also developed a number of stress reduction initiatives designed to help service members and their family members to cope with deployment separations. Those include 1–800 toll free OneSource program, supplemental child care with extended hours, non-medical family counselling, support with spousal career, and communication assistance during deployment (Byers, 2004).

Service members interviewed by Hosek et al. (2006) also mentioned deployment pays as a positive aspect of deployment. Although most of the compensation in the military comes in form of the basic pay which is determined by service members' pay grade and year

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of service,[4] specific amount of pay to each service member may vary due to special pays for specific skills, qualifications or events. For example, special pays are paid for dangerous duty assignments or for separations from the family. Military pay may depend on how much time service members spend away from home and the types of duties that require to be away from the family. Table 2.3 provides a hypothetical example of the monthly earnings of the married service member under three possibilities: (i) the soldier spends most time at the home station, (ii) the service member is away for a month from the home station but is not deployed, and (iii) the service member is deployed to war zone during a month. An E-3 with three years of service receives basic pay of $1,692.00/month. In addition, the service member would receive basic allowances for housing (BAH), and basic allowances for subsistence (BAS). While basic pay is subject to taxes, BAH and BAS are tax free. Thus, assuming that the service member faces a 20 percent tax rate, the tax burden would be $338.00/month, and the total monthly take home pay would be $2,900.[5] When the service member spends time away from home for education, unit training or exercises for at least 30 days, he or she is eligible to receive $250 as a family separation allowance (FSA).

When a service member is deployed (column 3 of Table 2.3), his or her pay increases to compensate for a separation from the family and for risk to his or her life. First, a service member with dependents deployed for over 30 days is eligible for a family separation allowance. In addition, a soldier deployed to a designated combat area can expect to receive imminent danger pay (previously known as hostile fire pay), hardship duty pay for arduous duty locations, and sometimes per diem, including payments for incidental expenses. Furthermore, when the service member is deployed, the basic pay and other pays are not taxable. If the service member is serving in a designated tax-free combat zone, all

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[4]See Asch et al. (2002) for a detailed description of different parts of cash compensation in the military. To attract and retain service members the military established a compensation system designed to compensate personnel for possible hardships of military life. This often means that pay in the military should be higher than the pay in civilian occupations that do not require workers to risk their lives. Evidence suggest that in 2000 military pay was in the 70th percentile of civilian pay and it was increasing since then (Hosek and Sharp, 2001). The military also provides various non-cash benefits some of which are directed towards family members. Those include subsidized on-base child care, medical care, commissary and exchange shopping, and on-base counselling. In addition, the military provides allowances to compensate for cost of food, and cost of housing. Basic allowances for housing is that it depends location, pay grade and whether service members have dependents. It is also tax free. Estimates suggest that the installation based benefits represent about 12 percent of the total military compensation (CBO, 2004).

[5]In this exercise I ignore a possibility that families may also qualify for an Earned Income Tax Credit. The monthly military earnings presented in table 2.3 can not be compared directly to the earnings of the civilian workers. Since many military allowances are not taxable, the comparable civilian earnings should be higher in order to achieve the same level of take home pay.

Table 2.3: Hypothetical Earnings at Home Base and on Deployment

	At home	Away not depl.	Depl.
E-3 with 3 years of service			
A. Basic pay	1,692	1,692	*1,692*
B. Basic allowances for housing (BAH)	*1,275*	*1,275*	*1,275*
C. Basic allowances for subsistence (BAS)	*272*	*272*	*50*
D. Special pays			
D1. Family separation allowance (FSA)		*250*	*250*
D2. Imminent danger pay (IDP)			*225*
D3. Temporary duty per diem			*105*
D4. Hardship duty pay for Iraq			*100*
E. Total before taxes (A+B+C+D)	3,239	3,489	3,697
F. Taxable income (A)	1,692	1,692	1,692
G. Combat zone tax exclusion	0	0	*1,692*
J. Tax burden (0.2 * (E–F))	338	338	0
Total monthly pay (E–J)	2,901	3,151	3,697
E-5 with 10 years of service			
A. Basic pay	2,497	2,497	2,497
B. Basic allowances for housing (BAH)	*1,377*	*1,377*	*1,377*
C. Basic allowances for subsistence (BAS)	*272*	*272*	*50*
D. Special pays			
D1. Family separation allowance (FSA)		*250*	*250*
D2. Imminent danger pay (IDP)			*225*
D3. Temporary duty per diem			*105*
D4. Hardship duty pay for Iraq			*100*
E. Total before taxes (A+B+C+D)	4,146	4,396	4,604
F. Taxable income (A)	2,497	2,497	2,497
G. Combat zone tax exclusion	0	0	*2,497*
J. Tax burden (0.2 * (E–F))	499	499	0
Total monthly pay (E–J)	3,647	3,897	4,604
O-4 with 10 years of service			
A. Basic pay	5,482	5,482	5,482
B. Basic allowances for housing (BAH)	*2,115*	*2,115*	*2,115*
C. Basic allowances for subsistence (BAS)	*272*	*272*	*50*
D. Special pays			
D1. Family separation allowance (FSA)		*250*	*250*
D2. Imminent danger pay (IDP)			*225*
D3. Temporary duty per diem			*105*
D4. Hardship duty pay for Iraq			*100*
E. Total before taxes(A+B+C+D)	7,869	8,119	8,327
F. Taxable income (A)	5,482	5,482	5,482
G. Combat zone tax exclusion	0	0	*5,482*
J. Tax burden (0.2 * (E–F))	1,096	1,096	0
Total monthly pay (E–J)	6,773	7,023	8,327

Note: Numbers in *italic* are tax free.

his or her income is tax free, including assignment and reenlistment bonuses.[6] As a result, the home take home pay of the service member would increase by over 20 percent.

2.5 Section Conclusions

The analysis in this dissertation contributes to the policy discussion by exploring how soldiers' time commitments may affect families. My review suggests that the literature on the labor market outcomes of the military spouses often ignores the time commitments that

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[6]The effect of the tax exemptions also depends on the amount of the Earned Income Tax Credit that service members are entitled to without deployment.

the military imposes on families. In particular, the military may require service members to be away from home for long periods for deployments, individual or unit training, and overtime duties at the base. As a result, the studies that do not take into account service member's time commitments may ignore important aspect of decisions within the household. In this dissertation, I extend the research by exploring how deployments may affect families.

The discussion in this section suggests that recent deployments may provide a significant shock to military households. War in Afghanistan and Iraq led to an unprecedented increase in frequency and duration of deployments. This suggests that recent deployments provide an unanticipated and exogenous shock to soldiers' time with the family. This allows us to examine how households respond to exogenous changes in time constraints.

The discussion above suggests that military life may affect wellbeing of the families in a number of ways. While many families enjoy opportunities serving in the military along with other benefits (e.g., education, housing, medical and dental care),[7] other families may find the multiple challenges involved in military life too much to endure. If all the negative factors taken together outweigh the benefits associated with the military job, the service members would be inclined to separate from the military. This reasoning is a cornerstone of the military household behavior model that I present in the next chapter.

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[7]The military life style also has benefits for the family including stable employment, valuable training and experience for the member, health care, housing, paid vacation, recreation facilities and others. The service member also takes these into account.

Chapter 3

Theoretical Effects of Deployments

In this chapter, I discuss how deployments may affect spousal labor supply and household wellbeing. I explore the role of deployments within an economic model of household wellbeing. The model postulates that a household behaves as if it maximizes its wellbeing (utility) given the constraints that the military life imposes, with the deployment being a major factor that determines how much time service members spend with their family. The role of the model is to guide our understanding of how deployments may affect spousal labor supply and household wellbeing. The predictions from the model are also discussed in light of the existing empirical literature from sociology and psychology. The sociology studies are concerned with stresses on the service member and his/her family. The psychology studies focus on the relationship between stress and family wellbeing.

3.1 An Economic Approach towards Modelling Deployments and Family Wellbeing

Since Becker (1965), economists have treated households as economic decision making units. Economic theory postulates that individual or household preferences and constraints are fundamental in understanding how deployments may affect the wellbeing of military families and determining spouses' labor supply decisions. Within a family, spouses usually make important decisions together, weighing how these decisions would affect household wellbeing or utility. A military family decides whether the spouse should be working, how many hours to work, where to live, whether and when to have children, whether to use on-base or off-

base child care. The decisions set of the military household may also include choices about leaving the military and about how long to stay in the military career.

Factors outside the usual set of economic variables may affect individual decisions within the utility maximization approach. There is a rich literature in the disciplines other than economics relevant to the issues discussed in this dissertation, and the model can include factors that are important to researchers from other disciplines. The utility function can implicitly or explicitly take into account work and personal stress that the spouses are exposed to, the role of each spouse in the decision making process, and roles that the spouses play in the household. As reviewed in Hosek et al. (2006), insights from literature on small group cohesion, combat motivation, organizational commitment and the military-family tensions, and combat stress can be incorporated into the model of individual retention behavior, and can help explain different behavioral responses.

3.1.1 Household Utility Model

I start from a simple model in which a spouse is making trade-offs between working in paid job, working at home, or enjoying leisure (for a household utility model without home production see Appendix A). Suppose that the spouse maximizes a utility function which is increasing in her[1] consumption of leisure (l) and composite commodity (X), $U = U(l, X)$.[2] The spouse divides her endowment of time between working in the market (m_1), contributing to the production of household composite goods (h_1), and leisure (l), $T = l + m_1 + h_1$. Suppose that consumption goods can be purchased on the market (X_M) or produced domestically (X_D), and these goods are perfect substitutes so that $X = X_D + X_M$.

Note that military families represent a special type of families in which a service member is always employed (while in the military) and does not have much leverage about how much time to spend at home. I assume that any time that the service member does not spend working on a military base (m_2) or on deployment (d) is used up in household production, $h_2 = T - m_2 - d$. As a result, the time that the service member contributes to home production is exogenous. This may be a plausible assumption in the case of the military families since the service member may often be ordered to deploy or to work long hours to

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[1]To simplify my discussion I will focus on families in which a male service member is married to a civilian wife. This type of arrangement represents majority of families in the military.

[2]This is a simplified version of the model presented in Gronau (1977) and Solberg and Wong (1991).

fulfill his duties. Although civilian workers may have some leverage over their work hours, evidence suggests that civilian workers may not always have a choice of their preferred hours of work. In particular, there is a significant disparity between preferred and observed hours of work (Clarkberg and Moen, 2001).

Since I treat soldiers' time at home as exogenous, spouses are the ones who make adjustments necessary to respond to shocks that the military life may impose on families. Qualitative evidence suggests that this assumption may reflect experiences of many military families. One of the spouses interviewed by Castaneda and Harrell (2008) mentioned that "My job definitely takes second priority. If there's ever a problem with my daughter or with scheduling difficulties, my job is always the one that has to take a backseat."

A spouse maximizes a utility function subject to a home production technology, income and time constraints:

$$\max_{l,X,h_1,m_1} U(l_1, X) \tag{3.1}$$

$$\text{s.t.} \quad l_1 + h_1 + m_1 = 1$$

$$h_2 + m_2 + d = 1$$

$$X = X_D + X_M$$

$$X_D = F(h_1, h_2)$$

$$X_M = wm_1 + vd + b$$

where w is wife's real after tax wage rate, $F(.)$ is a home production technology, v is basic pay, v deployment pay. In this model, the service member receives basic pay, which does not depend on hours of work.

The lagrangian for the case of an interior solution is:

$$\max_{h_1,m_1} \Omega = U\Big(1 - h_1 - m_1, w_1m_1 + vd + b + F(h_1, (1 - m_2 - d))\Big) \tag{3.2}$$

Assuming an interior solution, the first order conditions are:

$$\Omega_{h_1} = -U_l + U_X F_{h_1} = 0$$

$$\Omega_{m_1} = -U_l + wU_X = 0$$

or

$$\frac{U_l}{U_X} = F_{h_1} = w \tag{3.3}$$

3.1.2 Determinants of Equilibrium

First order conditions (3.3) describe an equilibrium amount of household and market work that a spouse performs. This choice is determined by household preferences, spousal marginal productivity at performing household duties, substitutability of inputs into the production of the household goods, and prices.[3] The wife chooses her contribution to the household production so that the marginal productivity at home is equal to the marginal productivity of market work (wage). Following Gronau (1977), I use a graphical interpretation of the results of the model. Figure 3.1 describes two types of equilibria for the spousal time allocation between home production and market work. The concave curve $TB_0'A_0C_0$ describes a home production function. At the point A_0, the spouse becomes marginally more productive at the market work than at home production, so she starts supplying her time to the market and earn a wage w along A_0E_0 line. A combination B_0 represents a good intensive consumption technology, in which the spouse allocates $0L_0$ units of time to leisure, L_0N to work in the market and NT to work at home. Alternatively, a combination B_0' provides an example of a time intensive combination of the consumption technology. In this case, the spouse allocates $0L_0'$ of her time to leisure and $L_0'T$ to work at home, and does not contribute any time to market work. Since the spouses may differ in their relative productivity between households, some spouses will devote most of their time to household production, while others will devote most of their time to market work.

Several factors may affect an equilibrium in this economy (also see Gronau (1977); Solberg and Wong (1991)). The spousal allocation of time may be affected by changes in market wages, changes in prices of market goods, and changes in home production technology. For instance, an increase in the wage that a spouse can get on the market would lead to a decline in time that the spouse work at home. Similarly, a decrease the price of market purchased goods would lead to a decrease in the time that the spouse works at home.

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[3]Since service member's contribution to the household is predetermined by the military, I ignore the issue of optimal division of household work between spouses.
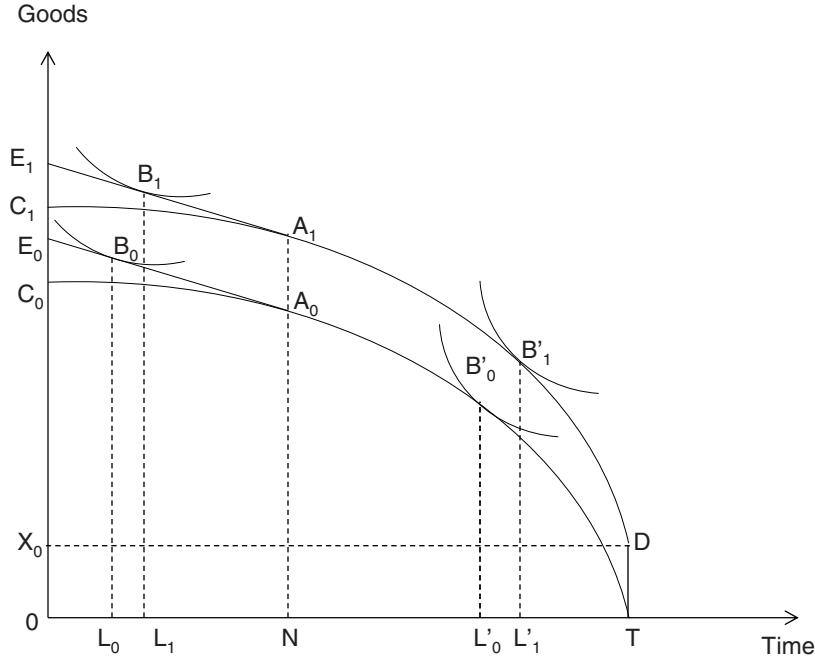
Figure 3.1: Model of Allocation of Time

3.2 Effect of Deployments on Spousal Labor Supply

Within the model presented in Section 3.1, deployments may affect spousal labor supply through several mechanisms. First, deployments turn a family into a single parent household, since a service member no longer contributes his time to household production. The spouse may need to respond to this change by increasing her time in household production. For example, a spouse of a deployed service member may have to bear the burden of an increased demand for child care, increased communication costs, as well as increased costs of other household duties that were previously done by the service member (for example, doing small repairs around the house). On the other hand, when the service member is deployed, the coordination costs of running the household may be lower. The spouse knows that he or she needs to take care of all the duties and arrange the lifestyle accordingly. In addition, if the service member is deployed he (or she) might receive deployment pay, which would increase household earnings.

3.2.1 Spousal Response to an Increase in Earnings

Deployments may affect spousal labor market behavior through an increase in earnings. My estimate in Section 2.4 suggests that deployments to combat zones may increase soldiers' earnings by over 20 percent. This estimate takes into account pays and allowances associated

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with the deployment as well as the tax free nature of the deployment earnings. Although this increase in income is designed to compensate a service member for the increased risk to life and for separation from the family, it may also affect the spousal employment choices. Assuming that leisure is a normal good, an increase in the household income would lead the spouse to increase leisure at the expense of market work. Figure 3.1 illustrates this response. An increase in household earnings leads to a parallel shift in a household production possibility frontier from $TB_0^{'}A_0E_0$ to $TB_1^{'}A_1E_1$. Those spouses who were working before the deployment reduce their work hours from L_0N to L_1N. Since this shift does not alter the relative productivity of the spouse at home versus market work, her contribution to home production stays the same as before (NT). An increase in earnings associated with deployments will also affect time allocation patterns among spouses who are out of the labor force. Point $B_0^{'}$ in Figure 3.1 represents a time allocation combination under which a spouse does not work in the market and divides her time between home production and leisure. An increase in soldier's earnings associated with deployments reduces the time that the spouse devotes to home work from $B_0^{'}T$ to $B_1^{'}T$.

3.2.2   Spousal Response to a Decrease in Service Member's Contribution to Home Production

Within my model the effect of a decrease in a service member's time at home on the spouse's time allocation is ambiguous. When a service member is deployed, he or she no longer contributes to the household production (for the moment ignore the change in the soldier's earnings associated with deployment). Since the spouse's choice depends on her relative productivity in market work versus household production, we can not predict the implications of the increase in deployments without specifying the exact nature of the changes in the home production and consumption technology. When a service member becomes deployed, some spouses may become relatively more productive at home, while other would become relatively more productive at market work. Figure 3.2 illustrates these two alternatives. A change in a production possibility frontier from $TB_0^{'}A_0E_0$ to $TB_1^{'}A_1E_1$ illustrates a case when the spouse becomes relatively more productive at home as a result of a deployment, a change in the production possibility frontier from $TB_0^{'}A_0E_0$ to $TB_2^{'}A_2E_2$ illustrates the case when the spouse becomes relatively less productive at home after the

Goods
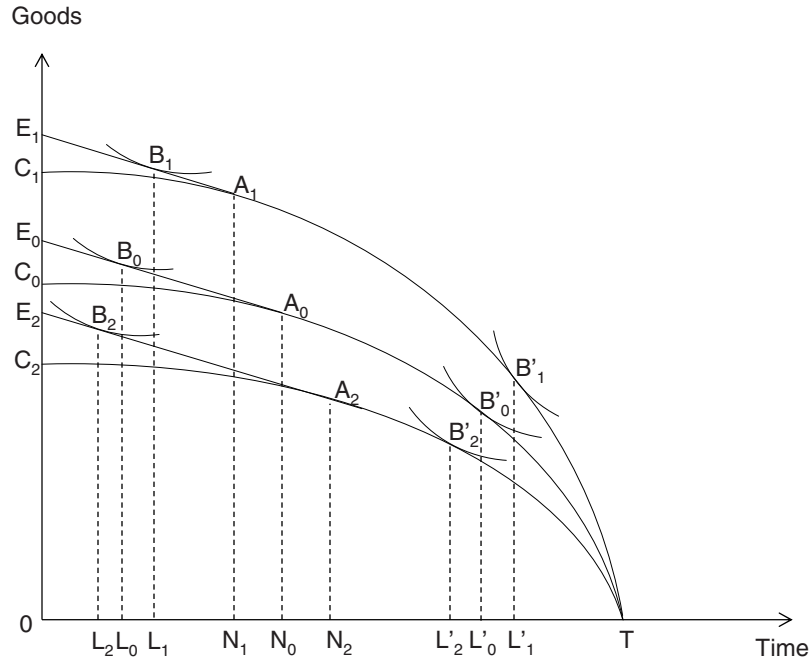
Figure 3.2: Response to Changes in Relative Productivity

service member's contribution to home production is no longer available. A spouse who becomes relatively more productive in household activities would be predicted to increase her contribution to household production. A spouse who becomes relatively more productive in market work is predicted to increase the purchase of market goods that substitute for home production (i.e. use paid child care, eating out more, hire cleaning services).

The response to a decrease in a soldier's time at home also depends on a degree of substitution between the spouse's and the soldier's home time. A wife may enjoy her time at home more when her husband is at home versus when the husband is away. If time in home production for the spouse and the service member are complements (substitutes), then, other things equal, the spouse will increase (decrease) her labor supply following a deployment. Since the evidence suggests that home time of spouses may be compliments (Lundberg, 1988; Kniesner, 1976), the spouse may work more when the service member is deployed assuming that income and wages are held constant.

Deployments may also affect labor supply by eliminating gains from specialization within a household. These gains arise from fixed time costs of home production. The time in many household activities depends little on the number of people in the family. It takes a similar amount of time to prepare a meal for 4 people as it takes to prepare a meal for 3 people. As a result, the total household time commitments do not change significantly when a

service member is deployed, leaving the spouse to take care of all household duties. When both spouses are present, one spouse may be cooking dinner, while the other may tend to children. When the service member is not available, both of those demands need to be performed by the spouse.

3.2.3 Spouses May Respond to Stress

Spouses may also respond to an increase in personal and work-related stress associated with deployments. Since service members are often deployed to dangerous areas, spouses may worry about their loved ones being in harm's way. According to the weekly casualty report released by the U.S. Department of Defense, many service members were killed or suffered injuries in the operations in Iraq and Afghanistan. As of October 10, 2007, a total of 38,347 service members had suffered war injuries. Of these, 4,262 died, 3,373 of them killed in action; 13,625 were wounded in action and could not return to duty; and 16,198 were less severely wounded and returned to duty within 72 hours.[4] This increase in emotional burden may change the marginal benefits of leisure versus the marginal benefits of market work, thus affecting spousal labor supply.

3.2.4 The Effects on Spousal Labor Force Participation

Although the predictions discussed above refer to spousal work hours, these can be extended to include the spousal labor force participation decisions. Big enough shifts in the household production possibility frontier may make some spouses exit labor force and divide their time between home production and leisure.

Exit from the labor force may also be explained by labor market rigidities which make it difficult for workers to find jobs with their desired work hours. There rigidities include limited opportunities for part time and flexible hours, low wages and lack of fringe benefits in the part time or flexible jobs. In fact, most evidence suggests that many workers can not get their desired hours of work (Stewart and Swaffield, 1997; Dickens and Lundberg, 1993; Altonji and Paxson, 1992), which contradicts the model outlined above that allows for a free choice over work hours. These rigidities may arise as a result of the fixed costs of hiring, training or employing a worker, or from the team production technology (Hammermesh,

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[4]Online at http://www.defenselink.mil/news/casualty.pdf (accessed October 10, 2007).

1993). These limits may be more important for military spouses who may have stronger desire for leisure or flexible work hours than civilian workers. If most of the job offers on the market are for full time positions, those spouses who prefer part time jobs or flexible arrangements may have to exit the labor force in response to deployments.

3.2.5 Role of Children in the Deployment Effects

The effect of deployment may differ by presence of young children in the household. Studies of civilian families suggest that parents of young children devote a lot of time to home production and child care. Although a husband may contribute less than a wife to home production and child care (women contribute about 4/5th of time to the additional work associated with the first child), deployments reduces the contribution of the husband to zero, so the wife has to make additional adjustments. Suppose that prior to a deployment both spouses contributed some time to home production. When the service member is deployed, the spouse may have to transfer some of her time to the child-care activities that were previously done by the service member. In the logic of the Gronau (1977) model, this time would be withdrawn from work in the market and leisure (from work at home an leisure for those spouses who are not in the labor force). The overall effect would depend on the leisure intensity of children in comparison to other activities and profitability of home production of child-related services. Since child care is relatively more time intensive good than many other household goods, a spouse with young children who is also working may be closer to the decision to leave labor force than a spouse without children. Therefore, deployments may have a larger effect in the families with small children than in the families with no children. The effect may also be driven by the price of market substitutes for the home provided child care. Since many spouses may live far away from their extended families, the option of the less expensive care from the relatives may not be available to them. Furthermore, the price of the market substitutes for the home-produced child care (babysitters, nursery school, kindergarten, school) declines as the child grows older, so the response to deployment may depend on the age of the youngest child in the household. It is more expensive to find substitutes for the home provided child care in families with young children.

Child care available outside the home may mitigate the effect of deployments on the

spousal labor supply. MacDermid et al. (2004) suggest that most military families with children younger than age 6 use non-parental child care at least some of the time (75%). Many of them rely on help from friends and neighbors (38%), grandparents (23%), and on-base Child Development Centers (21%). Furthermore, those families who experienced longer deployments were more likely to rely on informal (grandparents, friends, and neighbors) and/or nonmilitary (off-base child care centers) forms of care (MacDermid et al., 2004). Furthermore, the military provides a priority child care placement for families of deployed service members.

Rigidities in the labor market and child care may also lead to the differential effect of deployment by presence of young children in the household. Most spouses have strong incentives to stay attached to the labor force, since long withdrawals from the labor force are associated with lower lifetime earnings (Apps and Rees, 2000). However, a spouse may find it difficult to remain in the labor force when a husband is gone for a deployment. Most child care arrangements outside home impose constraints on how long can a child spend there and when the parents need to pick up the child, thus requiring the spouse to have a flexible job schedule. It may be more difficult or expensive to find additional child care if the spousal work schedules are irregular or inflexible. Some spouses interviewed by Castaneda and Harrell (2008) emphasize the difficulty of finding affordable child care when the service member is gone: "It affects my work when he is in the field because it's hard for me to be able to do my job because of the cost of day care . . . and night care because I work until 1 A.M., 2 A.M., or 3 A.M. in the morning, and if he's gone, it's really expensive to have somebody watch my son. He goes in the field and he stays out there for 2-3 weeks, a month, whatever they decide to do. It gets expensive for day care." Under these circumstances, even a small shock to the household production may change the spousal time allocation. If a service member can no longer pick up a child from day care, the spouse may have to leave the labor force and spend more time at home. In this case deployments may lead to the high rate of exit from the labor force among spouses with small children. Even though some spouses may remain in the labor force when they have small children, deployment shocks may force spouses to exit the labor force.

3.3 The Effect of Deployments on Family Wellbeing

The effect of deployment on the household wellbeing is ambiguous. On the one hand, deployments may make a spouse worse off since a service member no longer contributes to the household production. On the other hand, the spouse may appreciate an increase in earnings associated with deployments, as well as a sense of patriotic duty derived from deployments. Similar ambiguity is predicted in the household labor supply model without home production in Appendix Section A.3.

Service member's retention decisions reveal information about household wellbeing. New recruits sign a contract with the military for 2 to 8 years, with the median enlistment term of 4 years. After the initial commitment is over, a service member faces a choice of signing a new contract with the military (reenlist) or leaving the military to pursue a civilian career. Reenlistment decision sheds light on how family wellbeing while in the military compares to the family wellbeing in civilian life. The service member makes this decision after comparing expected household wellbeing under two possibilities: when he decides to stay or leave the military. If the soldier believes that the family would be better off in civilian world, he would be more willing to leave the military when the enlistment contract expires. This decision may be affected by perceived hardships of military life, expectations about military career opportunities, career opportunities for the service member and the spouse in civilian world, and benefits associated with staying in the military. While many families enjoy an opportunity of serving in the military along with other benefits (e.g., education, housing, medical and dental care),[5] other families may find the multiple challenges of the military life too much to endure. If all the negative factors taken together outweigh the benefits associated with the military job, the service members would be inclined to separate from the military.

A number of previous studies offer theoretical frameworks that incorporate deployments into the soldier's retention decision. A study by Hosek and Totten (2002) suggests that deployment experience helps a service member learn about his preference for deployments and the expected utility from remaining in the military. In this model, the service member joins the military with a set of expectations about how much they like deployments, the de-

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[5]The military life style also has benefits for the family including stable employment, valuable training and experience for the member, health care, housing, paid vacation, recreation facilities and others.

ployment frequency and duration, and the variance of deployment frequency and duration. Because deployment is a new experience for service members and their spouses, military families may also learn about the burdens and benefits of deployment through direct experience. Over time, the true deployment frequency and duration are revealed, so that the service member can update his beliefs. These new beliefs also change the expected utility from remaining in the military. If the expected utility from staying in the military becomes lower than the expected utility from leading a civilian life, the service member would be more likely to leave the military.

A recent study by Hosek et al. (2006) explores the role of deployment within the expected–utility model of deployments and individual utility. Several insights from that model are important to my analysis. Authors contribute to the literature by exploring how the probability of deployment, expected duration of deployment, and randomness of deployment length, base pay, and deployment pay affect utility. The model implies that service members have preferences over the deployment length, and many soldiers prefer some deployments to none. As a result, some service members who experience deployments may have a higher utility than those who were not deployed. If the actual deployment deviates from the preferred deployment, then the expected utility would decline. Those service members who were deployed for much longer than what they preferred would be more willing to leave the military. Hosek et al. (2006) also describe how their economic model may incorporate insights from sociology and psychology. They suggest that utility from the deployment time may depend on individual preparation, unit preparation, unit cohesion, combat/risk conditions, length of duty-day, communication with the family, family support programs, length of deployment, and uncertainty about the length of deployment.

Models outlined above can also be easily extended to consider wellbeing of married service members and their families. Married service members who make a retention decision may take into account the wellbeing of all members of the household. If a household expected utility from remaining in the military is lower than the expected utility from leading civilian life, the service member would leave the military.

3.4 Extending the Model

Next I discuss several other theoretical factors that may be important when exploring the effect of deployments on military families. First, I explore the role of selection into the military. Second, I discuss the issues related to changes in expectations about deployments.

3.4.1 Marriage Selection and Deployment

The demands that the military imposes on families may suggest that military spouses are a very selected group of people. Consider, for example, a young person who is thinking about marrying a service member. As suggested by Becker (1973, 1974), this young person would decide to proceed with the marriage only if the perceived benefits from being married is higher than perceived wellbeing from being alone. These benefits may aggregate over various factors which may be observed (household earnings, own employment, ability to pursue a career) or unobserved (quality and strength of the relationship). This young person may have some expectations about the hardships of the military life: long deployments, frequent moves, frequent overtime work, and risk of injury or death. Thus, the spouse may predict that these factors may affect his or her ability to have a preferred career. As a result, those people who see that their lifestyle would be constrained by military service will not decide to marry into the military, or decide to leave the military right after marriage.

Sorting of military families may also occur through retention. Those families who choose to stay in the military for another term have a different preference for the military lifestyle than the families who separate from the service when their contract is over. These families choose to be in the military despite the costs that it may impose. In addition, those who decide to marry into the military may plan to leave the military after one or perhaps two terms of service. The military may be an acceptable or even useful stepping stone to careers and a lifestyle after the military.

The selection hypothesis suggests that the deployment effect may differ with the time that a family spends in the military. Since the sample of families become more selected with years in the military, those families who are in the military the longest may have already accepted the hardships associated with deployments as a part of the military life, and may not respond much to deployments. Over time spouses may adapt to deployments by adjusting

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their behavior. For example, the spouses may develop human capital or select careers that may be more appropriate for the uncertainties of military life. They may choose career or occupations that allow them to react to short-notice moves, unexpected separations and deployments that last longer than planned. One of the spouses interviewed by Castaneda and Harrell (2008) support this argument by describing her experience: "I have the disposable jobs; I have the jobs that can be easily discarded and moved." Although the spouses joined the military with the expectations that service member would be deployed, the full extend of deployments is still a shock to them, thus they would respond in a manner discussed in section 3.2.

Existing evidence suggests that selective marriage and retention may be important among military families. Hosek and Totten (2002) find that the effect of deployment on reenlistment varies by a soldier's dependency status. Service members with dependents (most of them married) were more likely to reenlist for any given number of hostile or non-hostile deployments than those without any deployments, which is consistent with the selection hypothesis. Furthermore, Hosek and Totten (2002) find that among service members with dependents the reenlistment rate tends to increase with the number of hostile or non-hostile deployments. Hosek and Totten (2002) suggests that "this reflected an unobserved factor that predisposed a member to discover that deployment was satisfying, which correlated with getting married. Compared with other members, members who married while in service presumably found the military, and its deployments, to their liking." In other words, those service members who decide to marry might have learned about the hardships that the military imposes and are willing to start a family despite these hardships. Second, the spouses who decide to marry into the military may expect the hardships that the military service imposes on families and be willing to become a military spouse despite all the difficulties that the military life imposes on families.

3.4.2 Role of Expectations about Deployments

The pre-deployment equilibrium may also be affected by deployment expectations. Most service members can be certain that they will be deployed at some point in their military career. As a result, spouses marrying into the military may expect service members to spend some time away from home for military duties. Therefore, rational spouses may

invest into careers that allow for the flexible adjustment of labor supply, choose jobs with flexible schedules that easily accommodate time away, or develop human capital that may be more appropriate for the uncertainties of military life. Alternatively, some spouses might correctly anticipate the service member's future deployment but nevertheless accept employment in jobs that have rigid schedules. These jobs would be preferable if the expected wages were high enough to compensate for the possible disruption to work schedules caused by deployments.

Expectation hypothesis may also explain why the response to deployments differs over time. Recent deployments were likely to bring a change in the expectations of the future deployments. As shown in Figure 2.2, the deployments to operations in Afghanistan and Iraq lead to an increase in the likelihood and duration of deployments. As a result, the deployments early in the campaign would provide a true shock to the household, while the spouse may adjust their deployment expectations later in the campaign. While the extend of deployments were a true shock to the household in 2003, the deployments in 2005 should not differ substantially from what service members and the spouses are expecting, as the expectations about deployment likelihood and duration might have changed over time. Two alternative hypothesis may explain why the response to deployments may change over time. First, the spouses can adjust their career options to reflect higher deployment propensity in the future. They will select labor market strategies that minimize the costs imposes by deployments. The selection may also explain the difference in deployment effect over time. Second, an increase in the expected deployments leads to a change in the set of families who join the military or reenlist. The families who remain in the military may have a higher taste for deployments than those who leave the military.

3.5   Insights from Literature Beyond Economics

Literature beyond economics offers many insights into how military families may respond to deployment shocks. Psychological literature suggests that spousal employment may be important for personal wellbeing. Employment can be connected to such factors as self-fulfillment and self-satisfaction, which may be important determinants of the spousal happiness. In particular, those spouses who are engaged in activities outside home are both

psychologically and physically healthier (Barnett and Hyde, 2001). In addition, the income that spouses earn enhances self-esteem which in turn increases overall well-being (for review see Menaghan and Parcel (1990)). This suggests that a military spouse who works outside home may be happier with the military life and may be more likely to support the service member's future military career. At the same time, deployments may limit ability of the spouse to maintain her job, thus decreasing spousal satisfaction with the military.

Wife's employment may also increase a conflict within the family, since employment may strain the balance between different roles that a spouse plays in the households. The role strain literature suggests that it may be difficult for the spouse to perform different roles that make significant demands on individual resources and time (Goode, 1960; Voydanoff, 1988). This suggests that there may be a negative association between mother's work and marital quality, since a working wife may spend less time at home, may perceive higher level of role conflict and role overload, and may be more aware of the inequality in the household division of labor (Hill, 1988; Kingston and Nock, 1987; Spitze and South, 1985; Voydanoff, 1988; Hochschild, 1989; Rogers, 1996). The work-family tradeoff may also indirectly depend on the quality of work conditions. Those women who adjust their work behavior in response to the family responsibilities may end up in poor quality jobs, and the characteristics of those jobs may influence the satisfaction with the work and affect spousal personal wellbeing. Studies also find that it is not employment per se that may have a negative effect on spousal psychological well-being but rather an ability to balance different roles. Analysis in Ross and Mirowsky (1988) suggests that employed mothers who have no problem finding outside child care and whose husbands share child care have low levels of depression. Those mothers who find it more difficult to find additional child care and are solely responsible for child care experience very high level of stress and have relatively high levels of depression.

A family's response to deployments may also be driven by concerns about children. A parental absence from home may have a large effect on children. Deployments may diminish a child's sense of security, alter a child's level of responsibility, increase a child's level of loneliness, increase a fear of death of the parent, and increase disciplinary problems (Nelson and Hagedorn, 1997; Amen et al., 1988; Hiew, 1992). Children of deployed parents interviewed by Jensen et al. (1996) experienced higher level of self-reported depression than the children of non-deployed parents. These long separations also have adverse, although

small, effects on children's performance in schools. Deployment leads to one tenth of the standard deviation decrease in the children's performance on standardized tests (Lyle, 2006). Furthermore, these adverse effects of deployments may persist for several years (Engel et al., 2006). If the families believe that the long absences from home may have a negative effect on a child development, they will be more likely to leave the military when deployments become more common.

Sociological literature also examines the sources of conflict between family responsibilities and military's demands. Both the military and the family are examples of "greedy" institutions that require a significant amount of loyalty, participation and commitment from service members (Segal, 1988). Most spouses feel that the military imposes large demands on their families irrespectively of whether the service member is deployed or not. Spouses interviewed by Castaneda and Harrell (2008) highlight inflexibility of the military to accommodate family life on a daily basis. A spouse of an Army soldier with four children responded that "I guess I feel like I'm the basic care provider for all the children. There's a lot of times where there's something going on, and I have to cancel whatever I've got going on because he can't be supportive." This conflict of demands may be a source of tensions in the household, and may lead to a lower spousal support for retention. If spouses are dissatisfied with the demands imposed on service members, they may encourage the soldiers to leave the military (Bourg and Segal, 1999; Lakhani, 1995). Furthermore, researchers suggest that the spousal support for soldier's reenlistment depends on the degree to which the military is supportive of families (Segal and Harris, 1993).

Deployments also impose a significant emotional burden on family members. Since deployments are often beyond a family member's control, they are likely to increase a level of stress in the household. Even before a deployment a spouse may feel emotional and physical distance to the service member which may increase fears and anxiety for both the soldier and the spouse about the future of their relationship (Pincus et al., 2006). This psychological stress on the service member may also interfere with their job performance. In addition, the spouses at home may not be able to concentrate on routines, work or caring for children. As Pincus et al. (2006) put it, "the soldier's departure creates a hole which can lead to feelings numbness, sadness, being alone and abandonment." An analysis of the 2003 status of forces survey by Hosek et al. (2006) finds that time away from home increased

the likelihood of higher-than-usual personal stress, which is consistent with the strain that deployments place on families.

3.6   Chapter Conclusions

This chapter sets the basis for the empirical analysis in the rest of the dissertation. As the theory and the literature review suggests, deployments may affect spousal labor supply and family wellbeing through several mechanisms. Frequent deployments limit the time that service members spend with their families and contribute to household production. As a result, spouses of deployed service members may have to bear the increased burden of household duties such as child care, increased communication costs, as well as increased costs of other household duties that were previously done by the service member (for example, doing small repairs around the house). Overwhelmed with these demands the spouse may seek to reduce her hours of work or to leave labor force. Alternatively, the spouse may increase her employment and hire someone to help her with household duties. In addition, when the service member is deployed the coordination costs of running the household may be lower. The spouse knows that he or she needs to take care of all the duties and arrange the lifestyle accordingly. Furthermore, the spouse may also respond to an increase in earnings associated with deployments. If leisure is a normal good, this increase in earnings would lead to a decrease in spousal labor supply and an increase in household wellbeing. Overall, the theoretical effect of deployment on spousal labor supply and household wellbeing is ambiguous.

The theoretical model presented in this section suggest that the effect of deployment on spousal labor force participation may depend on deployment and household characteristics. For instance, the deployment effect may depend on the time intensiveness of household duties. Families with small children may have a different response to deployments than the families with no children. The analysis in the next chapters of this dissertation allows for this heterogeneous effects by estimating the effects of deployment separately in household with young children.

Another implication of the model is that the household's response will vary with the expected length of deployment. Since it is costly for a spouse to find a new job after the

service member returns from deployment, the spouse may not react to all deployments. For example, the spouse may not exit the labor force when the expected deployment is short.

I also suggest that the response to deployments may vary over time. First, the sample of military wives are an increasingly selected population as the military career progresses. Many soldiers merry young, and those who stay in the military may be a selected group, since the retention decision may take into account the spousal career prospects and aspirations. The spouses who believe that their career opportunities are greater in the civilian world would encourage service member to leave the military. The spouses may also adjust their behavior to adapt to the hardships of the military life.

Since the theoretical predictions about the response of spouses to deployments are ambiguous, the actual response of spouses to the time that service members spend away from home on deployment is an empirical question. This dissertation does not distinguish between the effect of additional pay, time away from home, and an increase in stress. All of these effects combined contribute to the deployment experience for spouses and together are predicted to affect the spousal labor force participation and household wellbeing.

Chapter 4

Data and Measures

4.1 Data

The empirical analysis in this dissertation relies on a unique dataset developed at the RAND Corporation that combines survey responses with administrative records. I use soldiers' responses to ten Status of Forces Surveys of Active-Duty members (SOFS) conducted by the Defense Manpower Data Center (DMDC) between July 2002 and December 2005.[1] Periodically, the DMDC surveys a random sample of active duty personnel to explore various issues relevant to military life. Each of these surveys collects information about soldier's and family's satisfaction with the military life, soldier's intentions to remain in the military, time that the soldier spends away from home for different military duties, and satisfaction with the military's support programs. Each of the surveys selected a non-proportional stratified, single stage random sample of approximately 35,000 active duty service members. As described in the documentation for the SOFS, the target population for all active-duty SOFS consists of (1) active-duty members of the Army, Navy, Marine Corps, and Air Force, (2) having at least 6 months of service at the time the questionnaire went into the field, (3) being below flag rank when the sample is drawn six months prior to the survey, and (4) excluding National Guard and Reserve members in active-duty programs. The SOFS samples were stratified by service, gender, paygrade group, race/ethnicity, regions, family status/dual service spouse. Apart from the variables that reveal spousal labor force

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[1]I use status of forces surveys conducted in July 2003, March, July, November 2003, April, August, December 2004, March, August, December 2005.

outcomes, this extract includes a unique identifier that can be linked to personnel records. As the first part of data processing, we secured a permission to link records from the SOFS to administrative personnel files.

In the next step of the analysis we linked survey responses to the administrative records for each service member. We obtained permission to link survey responses to records from the Active Duty Pay File (ADPF), Global War on Terrorism File (GWTF), Personnel Tempo file (Perstempo), and Defence Enrolment Eligibility Reporting System (DEERS). These records provide detailed characteristics of each service member, as well as provide information on soldier's deployment patterns. In particular, the ADPF includes all pays that service members receive each month. The GWTF records all service members who were deployed in support of the operations in Afghanistan and Iraq. The DEERS records all dependent who are related to the service member.

4.2 Measures

4.2.1 Spousal Labor Force Participation

I obtain information on spousal labor force participation from the Status of Forces Surveys of Active-Duty members (SOFS). The Bureau of Labor Statistics (BLS) considers a spouse to be in the labor force if he or she is employed or unemployed (has actively looked for work in the prior four weeks, and is currently available for work). The Status of Forces Survey replicates the labor force participation measures used by the BLS to describe labor force participation and employment of civilian workers. When responding to the survey, service members provide information on whether their spouses are working, looking for a job or temporarily out of work.

There are several concerns about the employment measure that I use. First, my measure does not capture a possibility that a spouse may respond to deployments by adjusting her hours of work. I only observe if the spouse is in or out of the labor force. Second, this measure does not capture possible labor force underutilization that may be common among military spouses. As described in Lim and Golinelli (2006), measures of the labor force underutilization classify workforce based on how long they were unemployed, and whether they undertake any temporary jobs recently. These measures also allow to identify whether

a spouse wants to find more work. Lim and Golinelli (2006) also suggest using the labor utilization framework to examine whether the spouses' jobs fit into their job aspirations. Some spouses in rural areas may only find jobs for which they are overqualified. Other spouses may only find full time jobs while preferring to have a part-time job. Unfortunately, the SOFS does not collect these measures.

4.2.2 Deployment Measures

For the purposes of this dissertation, being "deployed" means serving in the combat zone. As part of their duties, active duty personnel often have to leave their normally assigned duty area to serve temporarily in a military operation. After September 2001, an unprecedented number of active duty and reserve personnel were deployed in support of the Global War on Terrorism (GWOT) to serve in Afghanistan and Iraq.

For each soldier, I construct deployment histories that cover the time period between January 1999 and December 2006. Using the monthly pay records from the Active Duty Pay Files (ADPF) I identify deployed service members from the receipt of imminent danger pay (IDP). All soldiers deployed for more than 7 days to designated regions around the world receive IDP.[2] In particular, I identify the month when deployment started and the month when the soldier returned from deployment. I also determine whether the service member was deployed at the time of the survey.

As consistency checks I also conducted analysis by identifying deployment using the Global War on Terrorism File maintained by DMDC. For each service member this file records the start and end date of each deployment in support of the Global War on Terrorism. Since the results from this definition are similar to the results from the definition of deployment based on IDP, I concentrate my discussion on the deployment measures derived from the receipt of IDP.

My analysis also exploits variation in deployment timing relative to a survey. Since the surveys are distributed to a random sample of service members, some service members respond to the surveys while preparing to be deployed in the next few months, others respond to the survey while on a deployment, and yet another group of service members respond to the survey after returning from a deployment. To exploit these differences, I

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[2]A similar definition of deployment was used by Lyle (2006) and Hosek and Totten (1998).

create dummies that assign a service member to one of the following groups: (1) the service member is not deployed now but is going to be deployed 1, 2–3, or 4–6 months from the time of the survey; (2) the service member is not deployed now but returned from deployment 1, 2–3, 4–6, or 7–9 months ago; (3) the service member is deployed at the time of the survey. In the category of service members who are deployed at the time of the survey, I identify those who deployed 2 months or less before the survey, and those planing to return from deployment within two months of completing the survey. The base category include those who satisfy one of the following conditions: returned from deployment more than 9 months before the survey, will be deployed over 6 months after the survey, or were never deployed in the time span of this study.

4.2.3 Retention Intentions and Behavior

I use several reenlistment variables to examine the effect of deployments on household wellbeing. First, I use soldiers' responses to questions about their intentions to remain in the military. Each SOFS asks how likely it is that the service member chooses to stay in the military if given the opportunity. Specific wording is "Suppose that you have to decide whether to stay on active duty. Assuming you could stay, how likely is it that you would choose to do so?" Most service members respond that they are likely or very likely to stay in the military. This approach assumes that the response to the retention intentions questions reflects the hardships that the military life imposes on spouses and children.

I derive a measure of revealed household wellbeing from the actual reenlistment outcome. Each service member who joins the ranks of enlisted personnel signs a contract that specifies how long would the person serve, also known as a term of enlistment. When the contract expires, the service member has a choice of leaving the military or signing a new contract (re-enlisting). I characterize this reenlistment behavior following the algorithm described in Hosek and Totten (1998). I use an estimated term of service (ETS) variable from Perstempo file, which records the number of months that each service member has on his or her contract. At the end of the reenlistment term, the service member has an opportunity to sign a new contract with the military. Following Hosek and Totten (1998) I assume that the service member reenlists if the ETS variable changes by over 24 months, which reflects that the service member signed a new contract to serve in the military for over 24 more months. If

I observe that the ETS changed by less then 24 months I assume that the service member extended his or her current contract.

4.2.4 Other Covariates

I obtain most other covariates from administrative records. I collect information on service member's paygrade, branch of service, military occupation, race, and ethnicity from the ADPF. Then, I obtain information on the military family structure from the DEERS. Using monthly DEERS extracts I determine spouse's age, a number of children in the household, age of the youngest child, and a zip code for family residence. Next, I use the zip code record for each family to determine whether the household resides in a rural or urban area. Finally, I determine the county–level unemployment rate from the Local Area Unemployment Statistics provided by the Bureau of Labor Statistics.

4.3 Sample Restrictions and Descriptive Statistics

Since this study examines spousal labor force participation and family wellbeing, the sample is limited to families in which service members are married to civilian spouses. This criteria eliminates 10 percent of families with male service members who responded to the survey, and 50 percent of families with female service members responding to the survey. The resulting sample includes about 91 percent of families with a male service member. Among enlisted personnel, about 81 percent of families have children, and 45 percent of families have children under the age of 6. I also exclude reservists because the DMDC does not collect data on the employment of spouses of reservists.[3] The overall sample used for the analysis includes 31,970 enlisted and 23,963 offices.

Table 4.1 provides descriptive statistics for different sub-samples of the population of interest. The estimates are weighted by survey probability weights. A majority of spouses participate in the labor force. There are, however, differences in the labor force participation of spouses of enlisted service members and of officers. Spouses of enlisted personnel are more likely to participate in the labor force than spouses of officers. While 62 percent of spouses of enlisted personnel are in the labor force, only about 51 percent of spouses of officers

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[3]In 2002 there was a survey of spouses of activated reservists. However, these surveys were collected before major deployments in support of War in Iraq.

are in the labor force. This is surprising given that spouses of officers are slightly older and better educated than the spouses of enlisted personnel.[4] It is possible, however, that spouses of officers are more likely to participate in many activities on base which are not captured in the labor force participation variable, such as volunteering or leading informal spouse support networks. The differences in labor force participation may also be explained by the differences in earnings between enlisted personnel and officers. The higher pay received by officers implies that their spouses may start on a higher budget constraint than spouses of enlisted members. Given that there may be differences in the roles that spouses of enlisted and officers play in the household, I present separate estimates for spouses of enlisted personnel and officers.

Table 4.1 also provides means of all variables by service member's deployment status at the time of the survey. Spouses of deployed enlisted service members are about 6 percentage points less likely to be in the labor force than spouses of service members who are not deployed. The difference in the labor force participation of the spouses of deployed and not deployed officers is small and not statistically different from zero.

Although the selection of service members into deployment seems to be random from the organizational point of view, there are differences in the characteristics of service members who were or were not deployed in the month of the survey. Most of these differences reflect the way the military deploys personnel. For example, junior enlisted personnel and officers are more likely to be deployed at any particular point of time. This may be due to changes in assignments and job duties as service members progress through the military hierarchy. The descriptive statistics also reveal a difference in deployments between services. While 67 percent of deployed enlisted personnel are from the Army, they represent only about 38 percent of all service members. These differences suggest that it is important to control for the demographic and service characteristics of soldiers when making comparisons by deployment status. Furthermore, it is more likely that deployments are random once we control for service and occupational characteristics.

Service members in my sample are likely to stay in the military when their term is over. Table 4.2 provides descriptive statistics for retention intentions variable and for reenlistment

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[4]Estimates from DMDC (2007b) suggest that 69 percent of officer spouses have bachelor degree or more, while only 17 percent of enlisted spouses graduated from college.

Table 4.1: Descriptive Statistics

| | Deployed at the time of the survey | | | |
| | Enlisted | | Officer | |
	Yes	No	Yes	No
Spouse LFP	0.567	0.629	0.498	0.508
	(0.012)	(0.003)	(0.015)	(0.004)
Deployed	1.000	0.000	1.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
AFQT I–IIIA	0.633	0.674		
	(0.011)	(0.003)		
Senior (paygrades	0.589	0.656	0.464	0.499
E5–E9, O4–O6)	(0.012)	(0.004)	(0.015)	(0.004)
Lives off base	0.577	0.630	0.697	0.758
	(0.012)	(0.004)	(0.014)	(0.004)
Lives in Metro Area	0.664	0.689	0.664	0.741
	(0.011)	(0.003)	(0.014)	(0.004)
Lives outside CONUS	0.234	0.215	0.269	0.178
	(0.010)	(0.003)	(0.014)	(0.003)
Servive: Army	0.669	0.356	0.503	0.314
	(0.011)	(0.003)	(0.015)	(0.004)
Service: Navy	0.134	0.280	0.128	0.250
	(0.009)	(0.003)	(0.009)	(0.003)
Service: Marines	0.088	0.117	0.091	0.088
	(0.006)	(0.002)	(0.005)	(0.001)
Service: Air Force	0.109	0.248	0.278	0.349
	(0.007)	(0.003)	(0.014)	(0.004)
Spouse Age	28.473	29.699	34.674	35.743
	(0.170)	(0.056)	(0.213)	(0.061)
Education: HS Grad	0.799	0.717	0.012	0.033
	(0.009)	(0.003)	(0.003)	(0.001)
Education: College Grad	0.048	0.061	0.978	0.938
	(0.005)	(0.002)	(0.004)	(0.002)
Race and Ethnicity:	0.188	0.183	0.082	0.076
Black	(0.008)	(0.002)	(0.008)	(0.002)
Race and Ethnicity:	0.128	0.108	0.046	0.040
Hispanic	(0.007)	(0.002)	(0.006)	(0.001)
Race and Ethnicity:	0.060	0.076	0.048	0.055
Other	(0.005)	(0.002)	(0.007)	(0.002)
1 digit Occupation: 1	0.088	0.111	0.013	0.023
	(0.006)	(0.002)	(0.002)	(0.001)
1 digit Occupation: 2	0.111	0.088	0.448	0.308
	(0.008)	(0.002)	(0.015)	(0.004)
1 digit Occupation: 3	0.055	0.075	0.067	0.050
	(0.005)	(0.002)	(0.007)	(0.002)
1 digit Occupation: 4	0.026	0.034	0.108	0.132
	(0.004)	(0.001)	(0.010)	(0.003)
1 digit Occupation: 5	0.161	0.192	0.053	0.088
	(0.009)	(0.003)	(0.007)	(0.002)
1 digit Occupation: 6	0.204	0.226	0.096	0.162
	(0.009)	(0.003)	(0.008)	(0.003)
1 digit Occupation: 7	0.025	0.036	0.069	0.084
	(0.004)	(0.001)	(0.008)	(0.002)
1 digit Occupation: 8	0.118	0.087	0.123	0.098
	(0.008)	(0.002)	(0.010)	(0.002)
1 digit Occupation: 9	0.002	0.007	0.023	0.053
	(0.001)	(0.001)	(0.004)	(0.002)
Number of Children	1.479	1.460	1.535	1.586
	(0.028)	(0.009)	(0.039)	(0.010)
Age of youngest child:	0.121	0.107	0.093	0.098
under 1 year	(0.008)	(0.002)	(0.009)	(0.002)
Age of youngest child:	0.385	0.357	0.330	0.320
1-5	(0.012)	(0.003)	(0.014)	(0.004)
Age of youngest child:	0.194	0.202	0.213	0.222
6-12	(0.009)	(0.003)	(0.012)	(0.003)
Age of youngest child:	0.066	0.080	0.114	0.138
over 13	(0.005)	(0.002)	(0.009)	(0.003)
Service Member is Male	0.954	0.933	0.958	0.919
	(0.005)	(0.002)	(0.006)	(0.002)
County Unemployment	4.406	4.378	3.908	4.175
Rate	(0.063)	(0.018)	(0.074)	(0.019)
Observations	2467	28911	1602	22080

behavior variable. About 64 percent of enlisted service members in my sample are likely or very likely to stay in the military at the end of their term. About 74 percent of officers are willing to stay in the military beyond their current term (if given an opportunity) after their contract expires. Panel B of Table 4.2 provides mean for actual reenlistment behavior. This sample is limited to those service members for whom we observe reenlistment decision. We find that majority of soldiers stay in the military after their contract expires. About 68 percent of enlisted service members either sign a new contract or extend their current contract. This is very similar to the percentage of the service members who intend to stay in the military.

Table 4.2: Average Reenlistment and Retention Intentions in the sample

	Enlisted	Officer
A. Retention intentions		
Very unlikely to stay	0.111	0.062
	(0.002)	(0.002)
Unlikely to stay	0.127	0.110
	(0.002)	(0.002)
Neither likely nor unlikely to stay	0.118	0.092
	(0.002)	(0.002)
Likely to stay	0.303	0.320
	(0.003)	(0.003)
Very likely to stay	0.342	0.416
	(0.003)	(0.003)
Observations	31378	23682
B. Reenlistment behavior		
Reenlisted	0.335	
	(0.004)	
Extended contract	0.330	
	(0.004)	
Left the military	0.440	
	(0.004)	
Observations	13643	

4.4   Non-Response Bias

As with many other surveys, response bias is a possible concern with SOFS. Response rates in these surveys are around 30-35 percent. Unfortunately, I do not know a specific reason why a service member did not respond to the survey. As a result, one may speculate that the response rate is higher among service members with a strong viewpoint on some aspects of service life that they want to communicate to military leaders. However, there is no reason to believe that responses are systematically related to the variables that I include in my analysis, for example that service members whose spouses are employed were more likely to respond to survey.

Administrative records allow us to examine the difference between the outcomes of those service members who responded to the survey and those who did not respond to the survey. Since I obtain information on reenlistment behavior from the administrative records, these outcomes will be available for those who responded to the survey and those service members who did not respond to the survey. Table 4.3 provides average reenlistment and extension rates by whether the service member responded or did not respond to the survey. While 59 percent of those service members who responded to the survey stayed in the military after the end of the term (reenlisted or extended their contract), only 50 percent of those who did not respond to the survey stayed in the military at the end of the contract. Tabulations in Panels B and C of Table 4.3 suggest that the difference may be explained by a lower response rate among those service members who are planning to leave the military within the next 12 months. In particular, Panel B of Table 4.3 provides tabulations for those service members who have less than 12 month till the end of the enlistment contract. Among those service members, 70 percent of survey non-responders left the military at the end of the term, while only 57 percent of survey responders left the military in the end of the term. This suggests, that the response to the survey may be correlated with whether the soldier decides to stay in the military, and those soldiers who plan to leave the military soon do not fill out the survey. The difference in reenlistment behavior is very small among those service members who have more than a year on their enlistment contract from the time of the survey. It is unclear, however, whether the survey non-response would also be related to other variables that are included in the analysis, like spousal labor force participation.

Table 4.3: Reenlistment Behavior by Survey Non-Response

	Responded	Did not Respond	Difference
A. All			
Reenlisted	0.32	0.27	0.04
Extended	0.28	0.23	0.05
Leave	0.41	0.50	-0.09
B. Less then a year left on the enlistment contract			
Reenlisted	0.24	0.17	0.07
Extended	0.19	0.13	0.06
Leave	0.57	0.70	-0.13
C. More then a year left on the enlistment contract			
Reenlisted	0.34	0.33	0.01
Extended	0.31	0.29	0.02
Leave	0.35	0.38	-0.03

It is also possible that service members who are currently deployed are not well represented in the data. Given the burden of the separation from the family one may expect that

they would be more likely to use their computer time to communicate with their family members rather than completing the survey.

Chapter 5

Effect of Deployments on Spousal Labor Force Participation

Labor economists have long been interested in how labor supply responds to a temporary shock to income and household production. For instance, the literature on the added worker effect explores how an unanticipated unemployment spell or an illness affects spousal labor supply (Moehling, 2001; Lundberg, 1985; Stephens, 2002; Maloney, 1987, 1991). Although the behavioral model suggests that wives may increase their labor supply in response to an unexpected unemployment spell by their husband, the empirical evidence of the added worker effect is mixed.

In this chapter of the dissertation I examine how deployments affect spousal labor force participation and whether this effect depends on the household and deployment characteristics. Although deployment constitutes a shock to the household, this shock is conceptually different from the one described in the added worker effect literature. A spell of unemployment leads to a decline in household income and an increase in husband's contribution to home production. A deployment, on the other hand, leads to an increase in income and a decrease in the husband's contribution to home production. Since the theoretical predictions about the response of spouses to deployments are ambiguous (see chapter 3), the actual response of spouses to the time that service members spend away from home on deployment is an empirical question.

5.1 Empirical Approach

To examine the effects of service member's deployment on spousal employment, I start from a basic linear model with the following structure:

$$Y_{it} = \alpha + \delta D_{it} + \beta X_{it} + \theta_t + \varepsilon_{it} \tag{5.1}$$

Here, the left-hand-side variable Y_i is spousal labor force participation, α is a constant, and θ_t is a set of survey dummies. The coefficient δ on the dummy variable D_{it} represents the effect of service member deployment on spousal labor force participation. A negative coefficient means that deployment increases the likelihood that the spouse is out of the labor force. The variable X_{it} represents other covariates, including the spouse's age, gender, service member's race, education, AFQT score, paygrade, branch of service, military occupational specialty, location in an urban or rural area, county level unemployment rate, number of children, and categories of age of the youngest child in the household.

There are several conditions under which the estimates from equation (5.1) provide a causal effect of deployment. First, the deployment variable (D_{it}) should be free of measurement error. Since service members' deployments are constructed from administrative pay records, measurement error should not be a major problem. Service members have incentives to ensure they receive the payment to which they are entitled, while unit administrators ensure that service members can not claim time away without justification.

Another important condition for causality in equation (5.1) is that the deployment variable (D_{it}) is uncorrelated with other unobservable characteristics (ε_{it}), or is exogenous. A priory, there are reasons to believe that deployments are in fact exogenous. Service members can not directly affect their chances of being deployed. With the exception of service members in very few occupations (such as Special Forces), active duty soldiers can not volunteer for deployment if their units are not scheduled for deployment. They also cannot refuse to deploy without serious consequences for their career. Although the level of deployment differs between services and by military occupational specialty, once we control for these factors, the deployments should be exogenous to spousal labor force participation.

The potential for endogeneity of deployment may arise when some service members are chosen for deployment based on labor force participation of their spouses. Since some

deployments may involve only part of the unit, it is not impossible for a service member to campaign to stay home. For example, after a unit commander receives a deployment order for half of the unit, he or she may have an opportunity to select soldiers for deployment based on characteristics unobservable to researchers. If these characteristics are related to spousal labor force participation, the estimates of the deployment effect will be biased. For example, non-working spouses with large time commitments at home (due to small children) may have incentives to lobby service members to remain on base, so that service member can help at home. This would lead to an upward bias in the estimate of the deployment effect. Alternatively, the unit commander may have an incentive to deploy those who are performing well and leave less reliable people at home. In this case, those who are deployed may be of higher quality. If service member ability is also associated with spouse ability through the process of assortative mating and employment outcomes, there would be a downward bias in the estimates of the deployment effect.

I correct for possible endogeneity of individual deployment using an instrumental variables (IV) approach. I use unit deployment as an instrument for soldier's deployment (Lyle, 2006).[1] I create an instrumental variable by assigning a "1" to all those in a unit that had more than one-third of its soldiers deploy and a "0" otherwise. This is likely a valid instrument since service members in deployed units are more likely to deployed. Furthermore, the choice of the units for deployment is unlikely to be related to any unobservable factors that determine spousal labor force participation. Unit deployment is random from the point of view of service members and presents exogenous variation in time away from home. As explained in Lyle (2006) "most of the variation in the instrumental variable comes from division-level and brigade-level decisions as to which exact battalions receive a deployment order," which are unlikely to be based on unobserved characteristics related to spouse employment outcomes. As a result, the IV estimates that control for characteristics observed at the level of divisions and brigades would provide a good test of whether deployments are exogenous.

Given that both the outcome variable (employment) and the potentially endogenous variable (indicator for deployment) are binary, one would need to select an appropriate

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[1]Lyle (2006) uses battalion level deployment to examine effect of parental absences from home on children achievement. He finds that individual deployment is exogenous and estimates from OLS are very close to those from IV approach.

modelling approach. One possibility is a two-stage procedure where both regressions represent linear probability models. Angrist (2000) argues in favor of this method suggesting that it provides an estimate of the treatment effect—the average effect of treatment in an unselected population. The evidence from his Monte Carlo experiment suggests that linear probability models estimated by two stage least squares provide estimates of the treatment effect that are similar to the estimates from a properly specified bivariate probit model.

Another option is to use a bivariate probit approach that jointly models deployment and spousal labor force participation decisions (Greene, 1998a,b). This method is often used in research that examines the impact of a binary treatment on a binary outcome in a non-randomized setting. A common application of this method is the effect of taking a drug on mortality. When the data is obtained from self-selected samples, we may observe a spurious correlation between the treatment and outcomes when using standard binary dependent variable techniques. A recent study comparing the performance of different estimators in the case of endogenous binary variables suggests that bivariate probit generates the least bias over a wide set of parameters, even when the true data generating process is not bivariate probit, while the two-step procedure is inconsistent when the true data generating process is not normal (Bhattacharya et al., 2006). Bhattacharya et al. (2006) suggest that multivariate probit performs better than two-step or linear probability model estimators, especially "when there is more than one treatment, when the average probability of the dependent variable is close to 0 or 1, or when the data generating process is not normal." In this paper I compare estimates from both 2SLS and bivariate probit models.

My focus on the military families avoids several concerns that are often raised in the added worker effect literature. First concern is that the estimates of deployment may represent transitory factors that do not relate to characteristics of the family. In particular, one may worry that deployments have a direct effect on demands on local markers which would directly affect spousal employment opportunities. Previous studies, however, find little support for this hypothesis. In particular, (Loughran et al., 2006) estimate that the deployment of active duty personnel leads to a slight increase in aggregate local area employment. Furthermore, the nature of military deployments also allow to address a concern often raised in the added worker effect literature that shocks may proxy for unobserved characteristics of the household. In the military, deployments are considered to be exogenous to household

characteristics, since they are determined at the level of units, and assignment into units is random.

5.2 Results

5.2.1 Effect of Deployment in the Month of the Survey

Table 5.1 presents ordinary least squares (OLS) and two-stage least squares (2SLS) estimates of the impact of service member deployment on spousal labor force participation in the months of the survey. Panel A includes estimates from a sample of spouses of enlisted soldiers and panel B includes estimates from a sample of spouses of officers. Since some spouses appear in the data in several surveys, I cluster all standard errors on the individual spouse using Huber-White robust standard errors.

The OLS estimates of δ suggest that spouses of enlisted service members who are away from home are about 2.8 percentage points less likely to be in the labor force than the spouses of service members who are not away from home at a time of the survey (Table 5.1, Panel A, Column 1). Since about 62 percent of spouses of enlisted personnel are in the labor force, this corresponds to a 5 percent decrease in labor force participation as a result of deployment. This effect includes responses to several factors: increased earnings, decreased contribution to home production by service member, and increase in stress. Since we identify deployment from the receipt of Imminent Danger Pay, we can not distinguish between different explanations for the effect. All of these effects combined contribute to the deployment experience for spouses and together are predicted to affect spousal labor force participation.

Factors other than deployment are also related to spousal labor force participation. The estimates suggest that, after controlling for other characteristics, civilian wives of military personnel are less likely to be in the labor force than civilian husbands of military personnel; spouses who live in metropolitan areas are more likely to be in the labor force than those who live in rural areas or in small towns; spouses of black soldiers are more likely to be in labor force than spouses of white soldiers; spouses in families with young children are least likely to be in the labor force; and spouses who live in areas with high unemployment are less likely to be in labor force.

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Table 5.1: OLS and 2SLS Estimates for Service Members' Deployments

	A. Enlisted			B. Officer		
	OLS	2SLS		OLS	2SLS	
	(1)	(2)	(3)	(1)	(2)	(3)
Deployed	-0.028	-0.028		-0.005	-0.004	
	(0.010)	(0.014)		(0.012)	(0.021)	
Unit Deployed			0.669			0.623
			(0.008)			(0.013)
Senior	0.009	0.009	0.006	-0.029	-0.029	0.008
	(0.007)	(0.007)	(0.003)	(0.008)	(0.008)	(0.004)
Svc: Navy	0.005	0.005	-0.030	-0.008	-0.008	-0.024
	(0.007)	(0.007)	(0.003)	(0.009)	(0.009)	(0.004)
Svc: Marines	0.039	0.039	-0.051	0.009	0.009	-0.015
	(0.008)	(0.008)	(0.004)	(0.009)	(0.009)	(0.004)
Svc: Air Force	0.033	0.033	-0.021	-0.044	-0.044	-0.017
	(0.008)	(0.008)	(0.004)	(0.009)	(0.009)	(0.004)
Live off base	0.035	0.035	-0.003	0.071	0.071	-0.008
	(0.006)	(0.006)	(0.002)	(0.008)	(0.008)	(0.003)
Live in Metro Area	0.018	0.018	-0.005	0.018	0.018	-0.001
	(0.007)	(0.007)	(0.003)	(0.008)	(0.008)	(0.004)
Age of Spouse	-0.000	-0.000	-0.000	-0.005	-0.005	0.000
	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)	(0.000)
Race Ethnicity: Black	0.089	0.089	-0.000	0.141	0.141	-0.001
	(0.007)	(0.007)	(0.003)	(0.011)	(0.011)	(0.005)
Race Ethnicity: Hispanic	-0.025	-0.025	-0.003	0.011	0.011	0.004
	(0.008)	(0.008)	(0.003)	(0.015)	(0.015)	(0.007)
Race Ethnicity: Other	-0.009	-0.009	-0.004	-0.026	-0.026	-0.006
	(0.010)	(0.010)	(0.004)	(0.013)	(0.013)	(0.006)
Number of Children	0.006	0.006	-0.000	-0.017	-0.017	-0.000
	(0.003)	(0.003)	(0.001)	(0.003)	(0.003)	(0.002)
Age of Youngest child: under 1	-0.326	-0.326	0.002	-0.396	-0.396	-0.004
	(0.011)	(0.011)	(0.005)	(0.014)	(0.014)	(0.006)
Age of Youngest child: 1-5	-0.211	-0.211	0.004	-0.314	-0.314	0.004
	(0.009)	(0.009)	(0.004)	(0.011)	(0.011)	(0.005)
Age of Youngest child: 6-12	-0.054	-0.054	0.006	-0.118	-0.118	0.006
	(0.010)	(0.010)	(0.004)	(0.012)	(0.012)	(0.005)
Age of Youngest child: over 13	-0.012	-0.012	0.006	0.011	0.011	0.006
	(0.012)	(0.012)	(0.005)	(0.013)	(0.013)	(0.005)
Male	-0.089	-0.089	0.012	-0.206	-0.206	0.010
	(0.009)	(0.009)	(0.004)	(0.011)	(0.011)	(0.004)
County UR	-0.003	-0.003	-0.000	-0.006	-0.006	0.001
	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.001)
Educ: HS Grad	-0.009	-0.009	0.000			
	(0.007)	(0.007)	(0.003)			
Educ: College Grad				-0.045	-0.045	0.012
				(0.014)	(0.014)	(0.005)
AFQT: I-IIIA	0.012	0.012	-0.000			
	(0.006)	(0.006)	(0.002)			
R^2	0.07	0.07	0.52	0.14	0.14	0.33
Hausman p-value		0.68			0.56	
Observations	31963	31963	31963	23963	23963	23963

Note: Regressions also include controls for survey, and service member's military occupation. Robust standard errors in parentheses. Source: Estimations are based on Surveys of Active Duty Personnel conducted in July 2003, March, July, November 2003, April, August, December 2004, March, August, December 2005. The instrument used in 2SLS estimates is constructed from the unit of assignment. The unit is considered "deployed" when at least one-third of the unit is deployed during the months of the survey.

The 2SLS estimates in column 2 suggest that the bias from possible endogeneity of deployment is minimal. The first stage estimates from the 2SLS regressions (provided in column 3) are large and statistically significant and suggest that service members are more likely to de deployed when their unit is deployed. The t–statistics for the instrument are well over 10, suggesting that unit deployment is a strong instrument. Furthermore, the instrumental variable explains around 50 percent of the variation in individual deployments. The 2SLS estimates (provided in column 2) are very similar to the estimates from OLS, and a Hausman specification test fails to reject the null hypothesis that the orthogonality condition holds for all OLS specifications in Table 5.1. This suggests that the bias from possible "volunteering" for deployment is very small, and that spouses of service members whose deployment was affected by the instrument behave similarly to the spouses of service members whose deployment was not affected by the instrument.

The OLS and 2SLS estimates for officers (Column 4 of Table 5.1) suggest that deployment does not affect the labor force participation of officers' spouses. This is an interesting finding when contrasted with the results for spouses of enlisted personnel. The contrast may be explained by the different roles that spouses of enlisted service members and officers play in military households. Since the earnings of officers are higher than the earnings of enlisted personnel, the spouses may already rely on higher levels of external provision of household public goods. As a result, these spouses would not change their labor supply when officers are deployed. This explanation is consistent with a finding in the literature that officers often work overtime even when not deployed. Hosek et al. (2006) estimate that 50 percent of officers worked over 60 days overtime, even without deployment, while only 30 percent of enlisted personnel do so. As a result, the household arrangements in officer families may reflect higher demands on the officer's time even without deployment. Thus, deployment would not lead to a change in spousal labor force participation. This finding may also be explained by the different job opportunities available to officer and enlisted personnel spouses. Since the spouses of officers are better educated, they may receive higher wages in the civilian labor market than spouses of enlisted personnel, and they may rely on market provision of the household goods. For instance they may be more likely to rely on market child care and would not rely on service member. Furthermore, since spouses of officers are better educated than the spouses of enlisted personnel, they may be able to demand

more flexible job arrangements from their employers. In this case they would respond to deployments by reducing hours of work, rather than exiting labor force. This explanation is consistent with finding in Castaneda and Harrell (2008) who find that spousal education was an important predictor of how spouses interpret the effect of deployment on their own career: the higher their education level, the less likely they were to mention deployments as a factor in spousal career.

As I have discussed above, 2SLS may not be the best estimator when both endogenous variables are binary. In particular it is sensitive to the assumption that the data generating process is normal. In Table 5.2 I present probit and bivariate probit coefficient estimates of the impact of service member deployments on spouse employment. Estimated coefficients act in the same direction, although we can not compare the point estimates directly. Bivariate probit also provides an opportunity to test that service member deployment is endogenous. Table 5.2 provides an estimate of the ancillary parameter ρ which measures the correlation of the residuals from the two equations in the bivariate probit model. Results show the two equations are not strongly associated, since the estimate of $\rho = 0.008$ is not statistically different from zero. This suggests that individual deployments may in fact be exogenous to spousal labor force participation decisions.

In order to compare the estimates from the OLS and 2SLS models to the estimates from the probit and bivariate probit models, I estimate the marginal effects for the change in D_{it}. These estimates are presented in Table 5.3. Estimates in column 2 are based on the estimates in Table 5.1, columns 3 and 4. Note that the δ estimated using OLS and 2SLS has a marginal effect interpretation. Marginal effects for probit and bivariate probit are calculated using the formulas provided in Greene (1998b). The delta method is used to estimate standard errors.

The specifications tests in Tables 5.1 and 5.2, together with the discussion of the military deployment mechanism, support the argument that service member deployment is exogenous to the spousal labor force participation decision. Since the estimated marginal effects of OLS versus probit are very similar, I proceed using OLS for the rest of this chapter. This choice also accommodates my use of interaction terms to examine heterogenous response to deployments. Since I only have one instrument, the interactive specifications can not be

Table 5.2: Probit and Bivariate Probit Estimates for Service Members' Deployments

	A. Enlisted			B. Officer		
	Probit	Bivariate Probit		Probit	Bivariate Probit	
	(1)	(2)	(3)	(1)	(2)	(3)
Deployed	-0.075	-0.083		-0.015	-0.021	
	(0.027)	(0.037)		(0.034)	(0.059)	
Unit Deployed			2.608			2.223
			(0.033)			(0.041)
Senior	0.028	0.029	0.053	-0.080	-0.077	0.096
	(0.019)	(0.019)	(0.037)	(0.023)	(0.023)	(0.041)
Svc: Navy	0.013	0.017	-0.383	-0.021	-0.018	-0.275
	(0.020)	(0.021)	(0.040)	(0.025)	(0.026)	(0.044)
Svc: Marines	0.112	0.112	-0.509	0.025	0.026	-0.087
	(0.022)	(0.023)	(0.053)	(0.025)	(0.025)	(0.041)
Svc: Ari Force	0.094	0.097	-0.139	-0.125	-0.124	-0.125
	(0.024)	(0.024)	(0.049)	(0.025)	(0.025)	(0.042)
Live off base	0.098	0.100	-0.056	0.201	0.207	-0.074
	(0.016)	(0.016)	(0.031)	(0.021)	(0.021)	(0.034)
Live in Metro	0.051	0.046	-0.061	0.051	0.048	-0.010
Area	(0.019)	(0.019)	(0.036)	(0.024)	(0.024)	(0.040)
Live Outside	-0.169	-0.132	0.101	-0.226	-0.166	0.269
CONUS	(0.027)	(0.021)	(0.040)	(0.033)	(0.028)	(0.044)
Age of Spouse	-0.001	-0.001	-0.006	-0.016	-0.015	-0.000
	(0.001)	(0.001)	(0.003)	(0.002)	(0.002)	(0.003)
Race Ethnicity:	0.252	0.253	-0.010	0.403	0.404	-0.025
Black	(0.020)	(0.020)	(0.038)	(0.033)	(0.033)	(0.053)
Race Ethnicity:	-0.068	-0.071	-0.053	0.026	0.022	0.045
Hispanic	(0.023)	(0.023)	(0.045)	(0.043)	(0.043)	(0.072)
Race Ethnicity:	-0.024	-0.026	-0.054	-0.076	-0.077	-0.067
Other	(0.027)	(0.027)	(0.055)	(0.039)	(0.039)	(0.069)
Number of	0.017	0.016	-0.009	-0.047	-0.047	-0.004
children	(0.008)	(0.008)	(0.016)	(0.010)	(0.010)	(0.017)
Age of Youngest	-0.875	-0.875	0.047	-1.089	-1.090	-0.060
child: under 1	(0.032)	(0.032)	(0.063)	(0.041)	(0.041)	(0.073)
Age of Youngest	-0.580	-0.580	0.063	-0.850	-0.851	0.040
child: 1–5	(0.026)	(0.026)	(0.051)	(0.033)	(0.033)	(0.057)
Age of Youngest	-0.154	-0.154	0.097	-0.324	-0.324	0.067
child: 6–12	(0.030)	(0.030)	(0.058)	(0.034)	(0.034)	(0.060)
Age of Youngest	-0.026	-0.028	0.072	0.023	0.024	0.079
child: over 13	(0.037)	(0.037)	(0.070)	(0.036)	(0.036)	(0.062)
Male	-0.263	-0.262	0.190	-0.614	-0.614	0.143
	(0.030)	(0.030)	(0.068)	(0.036)	(0.036)	(0.067)
County UR	-0.009			-0.016		
	(0.004)			(0.005)		
Educ: HS Grad	-0.024	-0.024	-0.012			
	(0.021)	(0.021)	(0.041)			
Educ: College				-0.128	-0.127	0.222
Grad				(0.041)	(0.041)	(0.094)
AFQT: I–IIIA	0.036	0.037	-0.007			
	(0.017)	(0.017)	(0.033)			
ρ			0.008			-0.0045
p-value ($Pr > \chi^2$)			0.7558			0.8948
Observations	31,970	31,970	31,970	23,963	23,963	23,963

Note: Regressions also include controls for survey, and service member's military occupation. Robust standard errors in parentheses. Source: Estimations are based on Surveys of Active Duty Personnel conducted in July 2003, March, July, November 2003, April, August, December 2004, March, August, December 2005. The unit is considered "deployed" when at least one-third of the unit is deployed during the months of the survey.

Table 5.3: Marginal Effects from OLS, 2STS, Probit and Bivariate Probit Estimates of Service Members' Deployments

	A. Enlisted	B. Officer
OLS	-0.028	-0.008
	(0.010)	(0.012)
2SLS	-0.028	-0.002
	(0.014)	(0.021)
Probit	-0.029	-0.009
	(0.010)	(0.014)
Bivariate Probit	-0.031	-0.006
	(0.014)	(0.023)
Observations	31970	23963

Note: Regressions in both panels include survey dummies, controls for service member's military occupation, service, paygrade, education level, dummies for whether resides in metropolitan area, whether lives off-base, presence of children in different age categories. Robust standard errors in parentheses. Source: Estimations are based on Surveys of Active Duty Personnel conducted in July 2003, March, July, November 2003, April, August, December 2004, March, August, December 2005.

estimated using an IV approach.[2]

5.2.2 Response before and after Deployment

As described in Section 4.2.2, I observe not only whether a service member is deployed during a survey, but also a history of deployments. I use this deployment history to examine if spouses react to deployment before the deployment actually happens as well as after service members return from deployment. Since the military informs service members about their next deployment few months in advance, spouses may change their labor supply before deployment actually happens. Focus groups findings in Hosek et al. (2006) suggest that periods just before deployments are very demanding for both service members and their spouses. Many service members mentioned that they work long hours preparing for deployment, and spend weeks away from home for training and inspections. One of the service members interviewed by Hosek et al. (2006) described their pre-deployment experience: "In the Navy, you're so busy in the job the last two to three months before you go on deployment you work 7 a.m. to 6 p.m. every day" (Hosek et al., 2006).

Regression 1 in Table 5.4 provides estimates for service members who will be deployed in the future, are deployed now, or have returned from deployment in the last few months. The estimates for enlisted personnel suggest that spouses reduce their employment 2 to 3 months before the actual deployment.[3] This reaction is consistent with the theoretical model in

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[2]An alternative method which estimates 2SLS and OLS models in each of the groups of people separately provides similar results suggesting that deployments are exogenous to spousal labor force participation decision. Note, however, that the sample size of these estimates is much lower.

[3]I find similar responses to those presented in table 5.4 when I use deployment measures derived from the Global War on Terrorism file developed by DMDC. These records are more precise than the records from

which spouses reduce their labor supply in anticipation of service member deployment. It is also possible that spouses respond to increased demands on service members imposed by services just before deployment. When preparing for deployment, service members spend time away from home for unit training and spend long hours on the base.

Table 5.4: OLS Estimates of the Effect of Timing of Deployment

	A. Enlisted	B. Officers
	(1)	(2)
Expects deployment 4-6 months from now	0.000	-0.004
	(0.015)	(0.019)
Expects deployment 2-3 months from now	-0.030	-0.037
	(0.017)	(0.022)
Expects deployment under 1 months from now	-0.037	-0.011
	(0.017)	(0.021)
Got deployed 1 or 2 months ago	0.025	-0.005
	(0.020)	(0.025)
On deployment right now	-0.040	0.008
	(0.015)	(0.021)
Deployment ends 1-2 months from now	-0.035	-0.032
	(0.023)	(0.028)
Deployment ended 1 months ago	-0.021	-0.023
	(0.016)	(0.020)
Deployment ended 2-3 months ago	-0.040	-0.030
	(0.015)	(0.019)
Deployment ended 4-6 months ago	-0.009	-0.027
	(0.012)	(0.016)
Deployment ended 7-9 months ago	-0.022	-0.051
	(0.015)	(0.019)
Observations	31543	21386

Note: Regression (1) in both panels include survey dummies. Regression (2) in both panels include survey dummies, controls for service member's military occupation, service, paygrade, education level, dummies for whether resides in metropolitan area, whether lives off-base, presence of children in different age categories. Robust standard errors in parentheses. Source: Estimations are based on Surveys of Active Duty Personnel conducted in July 2003, March, July, November 2003, April, August, December 2004, March, August, December 2005.

Spouses are likely to have lower labor force participation throughout deployment. Results in Table 5.4 suggest that spouses of service members who started deployment over 2 months ago, and spouses of service members who are deployed and going to return from deployment in the next two months are 4.0 and 3.5 percentage points less likely to be in labor force, (respectively 7.2 and 7.0 percent change). Although the effects for families in which service members started deployment 1 or 2 months ago are not evident, the joint deployment effects are statistically different from zero.[4] The lack of effect in the first 2 months of deployment is most likely driven by the way the military conducts the survey. When contacting service members about spousal labor force participation, the military may not succeed in reaching those service members who were just deployed. In the first few months after the start of the deployment, the service member's address on the personnel file may

the pay file since they include exact date of the beginning and end of deployment.

[4]The F–statistics on the test is 4.49.

not be updated, so that the survey notice may not reach service members before the survey window is closed. Furthermore, internet communications may not be well established right after deployment.

The effect on spousal employment gradually disappears after service members return from deployment. Results for variables that identify months since the end of deployment suggest that spouses gradually increase their labor force participation after deployment ends. By 7 to 9 months after the end of deployment, the difference between those who returned from deployment and those who were not deployed is very small. This suggests that spouses are able to return to the labor force after deployment is over. It is not clear, however, whether this effect is driven by the flexibility of their occupational skills which allows them to take some time off and return to labor force, or by the types of jobs that spouses select. No existing literature examines the types of occupations chosen by military spouses, and whether their choices are driven by the nature of military life.

It is important to note that 2 to 3 months after service members return from deployment, the spouses of enlisted personnel are still 4.0 percentage points less likely to be in the labor force. This effect may be caused by a permanent change of station (PCS) that some service members experience after they return from deployment. As a part of the military career, many service members experience frequent moves between bases. Estimates suggest that the enlisted family moves every 3 years (Harrell et al., 2004). Since current regulations limit the PCS moves during deployment, many service members have to move to new locations after their deployments end. As a result, some spouses may not come back to the labor force right after the end of deployment but may wait until the family moves into a new area.

Spouses of officers do not have strong responses before, during, or right after the end of deployment. Most of the estimates for officer spouses are not statistically different from zero. Surprisingly, I find results that are statistically different from zero 4-6 and 7-9 months after officers return from deployment. Spouses of offices who returned from deployed 7 to 9 months ago are 5.1 percentage points less likely to be in labor force. This may be driven in part by patterns of fertility among some military families.

5.2.3 Deployment Effects by Household and Deployment Characteristics

Since spouses may react to deployments differently based on observed household characteristics, interaction specifications for spousal employment are presented in Table 5.5. Panel A compares the deployment effect when families are stratified by age of the youngest child. Deployment has the biggest negative effect on spousal employment in families with small children. In families where the youngest child is under age 6, deployment reduces labor force participation of the spouse by 4.9 percentage points (or 8 percent change). The effect is smaller (in absolute terms) for the families where the youngest child is age 6 to 12. In families with children over the age of 13, deployment leads to higher spousal labor force participation, although this effect is not statistically different from zero. This pattern of response supports the hypothesis that deployment has the biggest effect among families where household duties are relatively more demanding, like households with young children. Among spouses of officers, the effects have a similar U–shape as for spouses of enlisted personnel (negative effect in families with children under the age of 12, and positive effect in families with older children or with no children), although none of the effects are statistically different from zero.

Panel B of Table 5.5 includes similar specifications that compare families with the husband in the military versus families with the wife in the military. Deployment has a negative effect on spousal labor force participation only in families with the husband in the military, which are the majority of families in the military.

I find little difference in the deployment effect based on whether the family lives on– or off–base. Panel C of Table 5.5 allows the estimate of deployment to differ based on whether the families live on– or off–base. The majority of enlisted families live off base (63 percent), which allows families to better meet their housing demands and permits spouses to live near their jobs. Some of the families may live far enough from the base that it becomes difficult to access services available at the military base at subsidized rates. The estimated effects, however, suggest that spouses have similar reactions to deployment irrespectively of whether they live on– or off–base, as the point estimates of the effect of deployment are not statistically distinguishable. This is an interesting result since some would suspect that availability of subsided child care would have lowered the effect of deployment among the

Table 5.5: OLS Interacted Service Member's Absence from Home

	Enlisted	Officers
A. Age of Youngest Child		
no children	-0.006	0.024
	(0.020)	(0.025)
under 5 years old	-0.049	-0.013
	(0.015)	(0.018)
6 to 12 years	-0.024	-0.021
	(0.021)	(0.026)
over 12 years	0.042	0.002
	(0.032)	(0.033)
B. Wife vs Husband in the military		
Husband in the military	-0.030	-0.005
	(0.010)	(0.012)
Wife in the military	0.021	-0.022
	(0.041)	(0.052)
C. Live on Base versus off-base		
Live on base	-0.032	0.007
	(0.016)	(0.022)
Live off base	-0.025	-0.011
	(0.013)	(0.014)
D. Live on Metropolitan Area		
Live outside Metropolitan Area	-0.043	-0.019
	(0.017)	(0.021)
Live in a metropolitan area	-0.020	0.001
	(0.012)	(0.015)
E. By service		
Army	-0.038	-0.020
	(0.013)	(0.019)
Navy	0.014	0.012
	(0.026)	(0.032)
Marines	-0.008	-0.003
	(0.026)	(0.023)
Air Force	-0.045	0.006
	(0.029)	(0.027)
Observations	31,970	23,963

Note: Regression (1) in both panels include survey dummies. Regression (2) in both panels include survey dummies, controls for service member's military occupation, service, paygrade, education level, dummies for whether resides in metropolitan area, whether lives off-base, presence of children in different age categories. Robust standard errors in parentheses. Source: Estimations are based on Surveys of Active Duty Personnel conducted in July 2003, March, July, November 2003, April, August, December 2004, March, August, December 2005.

spouses who live on base.

The response of the spouse may also depend on the location of the military base. Although the majority of families (almost 70 percent) live within metropolitan areas, there are many spouses who have to live in rural areas or small towns because of the service member's assignment. Most researchers characterize those areas as having poor job opportunities for the military spouse, since there are very few employers who are willing to hire them. In addition, these areas may not have the jobs that match the spouse's career aspirations or education. If the current job of the spouse does not match his or her career aspirations, the spouse may feel little attachment to the job and may be more willing to exit labor force as a result of deployment. Alternatively, if the job opportunities for spouses in small towns are limited, the spouse may not be willing to part with his or her job for the period of deployment since it will be more difficult to find a new job after deployment is over. In addition, spouses may have different labor supply responses based on location. For example, jobs with flexible work hours may be readily available in larger cities, while not available in small towns. At the same time, large cities also have higher costs of living and costs of hiring someone to help with household duties such as child care. Estimates in Panel D of Table 5.5 suggest that service members' absences have large adverse effects if families reside outside metropolitan areas than if families live in metropolitan areas, although this difference is not statistically different from zero.[5]. The difference in this estimate may also reveal the difference in the distribution of military services by locations.[6]

There are several reasons why spouses in different military services would respond differently to deployment. First, deployment lengths are different between services. While the median total deployment length among the Marines in my sample is 5.6 months, the median deployment length for Army personnel is 11 months. Additional differences may arise from the role of personal stress resulting from service member's exposure to combat. Services differ in their exposure to combat. Most of the fighting on the ground is done by soldiers in the Army and the Marines. Hence, spouses may react differently. The estimate in Panel E of Table 5.5 suggests that most of the response comes from the Army families

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[5]The difference between effects in metropolitan versus outside the metropolitan are is -0.023 with t statistics of -1.11

[6]Around 67 percent of the Army, 63 percent of Air Force, 71 percent of Marines, and 74 percent of Navy enlisted families live within metropolitan area.

and that this response is negative in other services, although not statistically different from zero.

Table 5.6 further explores the possibility that spouses react to the expected time that service members are away. Since it is costly to look for a new job, short deployments may not compel spouses to leave the labor force. Spouses may only change their behavior if service members are going to be away from home for a long period of time. Panel B of Table 5.6 provides evidence that spouses react to deployment if the total deployment is long. Specifically, the deployment effect is small and statistically different from zero if the total deployment length is under 4 months.

Table 5.6: OLS Interacted Service Member's Deployments

	Enlisted	Officers
A. By remaining time on deployment		
Remaining deployment under 4 months	-0.008	0.006
	(0.017)	(0.020)
Remaining deployment over 4 months	-0.035	0.002
	(0.017)	(0.023)
B. By total deployment time		
Total deployment length under 4 months	0.016	0.010
	(0.021)	(0.020)
Total deployment length 5 to 8 months	-0.047	-0.043
	(0.022)	(0.026)
Total deployment length 9 to 12 months	-0.050	-0.041
	(0.023)	(0.036)
Total deployment length over 12 months	-0.032	0.044
	(0.021)	(0.029)
Observations	31,970	23,963

Note: Regression (1) in both panels include survey dummies. Regression (2) in both panels include survey dummies, controls for service member's military occupation, service, paygrade, education level, dummies for whether resides in metropolitan area, whether lives off-base, presence of children in different age categories. Robust standard errors in parentheses. Source: Estimations are based on Surveys of Active Duty Personnel conducted in July 2003, March, July, November 2003, April, August, December 2004, March, August, December 2005.

5.2.4 Response to Deployment in Different Phases of the Military Campaign

Interaction specifications in Table 5.7 examine whether the response to deployment changes with the time that families spend in the military and with the progress of the military campaign. Panel A of Table 5.7 provides the estimates of the deployment effects interacted with service member's years of service. These results suggest that deployments have large negative effects on spousal labor force participation if a service member have spent less then 6 years in the military. Among spouses of enlisted service members with less than three years of service deployments reduce spousal labor force participation by 5.4 percentage points. Among spouses of service members with four to six years of service deployments reduce labor

force participation by 3.8 percentage points. I find a similar pattern of responses when I explore deployment effect by the time that the family spend in the military (Panel B of Table 5.7). The deployment effect is negative and statistically different from zero among new families, and it is statistically indistinguishable from zero among the families who spend over 6 years in the military. Similar patterns hold if we slice deployment effect by term of enlistment (Panel C of Table 5.7). Deployments have a negative effect on spousal labor force participation among those families who are in their first or second term of enlistment. Deployments of first term enlisted personnel decrease spousal labor force participation by 4.6 percentage points, and deployments of second term personnel reduce spousal labor force participation by 3.9 percentage points. In the families of service members who are beyond the second term of enlistment deployments do not have much effect on spousal labor force participation.

Responses in Panels A through C of Table 5.7 may be consistent with several hypotheses. First, these results support the hypothesis that spouses may change their labor supply behavior over time to accommodate possible deployments. Over time spouses may learn less costly ways to respond to deployments. Some spouses may concentrate their job search on finding employment with firms that offer more flexible job arrangements, other may develop human capital that may be more appropriate to the uncertainties of the military schedules. As a result, the spousal response to deployments becomes smaller with soldiers' years of service or with family age. These results are also consistent with selective reenlistment of families based on perceived hardships of deployments. Spouses who stay in the military for over several years are different from a set of spouses who just married into the military. If spouses believe that deployments reduce their career opportunities, they will be more likely to leave the military when service member's contract expires. As a result, the response to deployments will be small among families who have made reenlistment decisions already.

The effect of deployment on spousal labor force participation also differs by stages of the military campaign. Panel D of Table 5.7 provides estimates of the deployment effect interacted with the year of the survey. These results suggest that the effect of deployment was the biggest in 2002–2003, the early stages of the war in Afghanistan and Iraq. This would be consistent with the explanation that the extent of deployments was a true shock to most families early in the campaign, while the families and the military become more

Table 5.7: OLS Interacted Service Member's Absence from Home

	Enlisted	Officer
A. Years of Service		
0–3 years	-0.054	-0.012
	(0.020)***	(0.040)
4–6 years	-0.038	-0.016
	(0.021)*	(0.039)
7–10 years	-0.001	0.012
	(0.023)	(0.031)
over 10 years	-0.015	-0.007
	(0.016)	(0.015)
B. Age of the family		
0–3 years	-0.051	0.042
	(0.017)***	(0.030)
4–6 years	-0.034	-0.043
	(0.029)	(0.037)
over 6 years	-0.013	-0.015
	(0.018)	(0.016)
C. Term of Service		
first term	-0.046	
	(0.019)**	
second term	-0.039	
	(0.018)**	
beyond the second term	-0.006	
	(0.015)	
D. Year of the Survey		
2002–2003	-0.052	0.014
	(0.018)***	(0.019)
2004	-0.004	-0.025
	(0.017)	(0.021)
2005	-0.026	-0.009
	(0.016)*	(0.022)
E. By First or Second Deployment		
First deployment	-0.039	0.010
	(0.012)***	(0.015)
Second deployment	-0.006	-0.042
	(0.016)	(0.023)*
Observations	32219	23899

Note: Regression (1) in both panels include survey dummies. Regression (2) in both panels include survey dummies, controls for service member's military occupation, service, paygrade, education level, dummies for whether resides in metropolitan area, whether lives off-base, presence of children in different age categories. Robust standard errors in parentheses. Source: Estimations are based on Surveys of Active Duty Personnel conducted in July 2003, March, July, November 2003, April, August, December 2004, March, August, December 2005.

prepared as time went by. This evidence is also consistent with an alternative explanation that the set of spouses who joined the military or who remained in the military changed over time.

Estimates in Table 5.8 illustrate the selection hypothesis by presenting the estimates of the deployment effect by survey year and the term of enlistment. Results in Panel A of Table 5.8 suggests that deployments of the first and second term enlisted personnel decreases spousal labor supply in each of the periods. Even though the sample of the spouses who are married to the first term enlisted personnel may differ over time, the spouses in 2005 respond to deployments by reducing their labor supply. This is not true, however, for the spouses of service members who are beyond their second term of enlistment. Results in Panel B of Table 5.8 suggest that even though the spouses responded to deployments in 2002–2003, the effect of deployments was not different from zero in 2005. This effect may be driven by unobserved differences in the preferences for deployment time among those families who reenlist or leave the military.

Table 5.8: Estimated Effect of Deployment in Different Campaign Periods

	2002-2003	2004	2005
A. Enlisted first or second term			
Deployed now	-0.056	-0.032	-0.049
	(0.025)	(0.022)	(0.021)
B. Enlisted, beyond second term			
Deployed now	-0.045	0.042	0.009
	(0.026)	(0.027)	(0.025)

Note: Regressions in both panels include survey dummies, controls for service member's military occupation, service, paygrade, education level, dummies for whether resides in metropolitan area, whether lives off-base, presence of children in different age categories. Robust standard errors in parentheses. Source: Estimations are based on Surveys of Active Duty Personnel conducted in July 2003, March, July, November 2003, April, August, December 2004, March, August, December 2005. Estimates in Panel B are based on 17540 observations. Estimates in Panel C are based on 14423 observations.

5.2.5   Spouses Do not Respond to Non-Hostile Deployments

Next, I explore whether spouses have a different response to hostile versus non-hostile deployments. The analysis throughout this chapter revealed that deployments to war zones, also known as hostile deployments, reduce spousal labor force participation. We do not know, however, whether the spouses respond only to service member's absences from home (reduction in service member's contribution to household production), to increase in earnings associated with deployment, or to the increase in the personal stress that spouses experience. The goal of this section is to distinguish between some of these hypotheses by

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comparing spousal response to hostile versus non-hostile deployments.

There are several reasons why spouses may respond differently to hostile versus non-hostile deployments. First, hostile deployments lead to a larger increase in pay than non-hostile deployments. While both types of deployments trigger an increase in pay through allowances (FSA or IDP), only hostile deployments lead to increase in pay due to a combat zone tax exclusion. Service members on non-hostile deployments receive FSA only and are not usually eligible for the combat zone tax exclusion. Second, hostile deployments are usually more dangerous than non-hostile deployments. As a result, the level of personal stress associated with non-hostile deployments may be much lower than the level of stress associated with the deployments to war zones. Third, hostile deployments are usually longer than non-hostile deployments. As a result, spousal response to non-hostile deployment would represent mainly the response to the service member's absence from the household production, and not the response to an increase in earnings, or an increase in personal stress.

Table 5.9 presents results for the specifications that estimate a separate effect of hostile and non-hostile deployments on spousal labor force participation. I find that spouses of enlisted personnel reduce their labor force participation in response to hostile deployments, and do not change their labor force participation in response to non-hostile deployments. I estimate that a hostile deployment reduces spousal labor force participation by 2.6 percentage points, which is very close to the effect that I have found in the previous section. Note, however, that spouses do not reduce their labor force participation when service member is away from home for a long period of time for non-hostile duties. The coefficient on the non-hostile deployment variable is very close to zero. This is surprising given that the service member should be away for at least a month to be considered on a non-hostile deployment.

Results in Table 5.9 suggest that spousal response to hostile deployments does not depend on an increase in earnings associated with deployment. After controlling for pay grade and years of service, the variation in soldier's earnings can be explained by allowances and tax advantage associated with deployments (earnings of deployed service members increase by 23 percent when service member is deployed). While the coefficient on a hostile deployment variable is negative and statistically significant, the coefficient on an after tax military earnings variable is very close to zero and not statistically significant. This suggest that it

Table 5.9: OLS Estimates for Service Members' Hostile and Non-Hostile Deployments

	A. Enlisted	B. Officer
On Hostile Deployment	-0.026	-0.005
	(0.010)	(0.012)
On Non-Hostile Deployment	0.002	-0.012
	(0.010)	(0.016)
After Tax Military Pay	0.002	-0.017
	(0.011)	(0.011)
Svc: Navy	0.008	-0.003
	(0.007)	(0.009)
Svc: Marines	0.039	0.007
	(0.008)	(0.009)
Svc: Air Force	0.039	-0.047
	(0.009)	(0.009)
Live off base	0.033	0.073
	(0.006)	(0.008)
Live in Metro Area	0.019	0.019
	(0.007)	(0.008)
Live Outside OCONUS	-0.062	-0.079
	(0.010)	(0.012)
Age of Spouse	-0.001	-0.004
	(0.001)	(0.001)
Race Ethnicity: Black	0.089	0.140
	(0.007)	(0.011)
Race Ethnicity: Hispanic	-0.024	0.008
	(0.008)	(0.015)
Race Ethnicity: Other	-0.007	-0.026
	(0.010)	(0.013)
Number of Children	0.005	-0.017
	(0.003)	(0.003)
Age of Youngest child: under 1	-0.323	-0.395
	(0.012)	(0.014)
Age of Youngest child: 1-5	-0.208	-0.313
	(0.009)	(0.011)
Age of Youngest child: 6-12	-0.056	-0.116
	(0.010)	(0.012)
Age of Youngest child: over 13	-0.015	0.018
	(0.012)	(0.013)
Male	-0.094	-0.200
	(0.010)	(0.011)
County UR	-0.003	-0.006
	(0.001)	(0.002)
Educ: HS Grad	-0.005	
	(0.008)	
Educ: College Grad		-0.038
		(0.014)
AFQT: I-IIIA	0.012	
	(0.006)	
R^2	0.08	0.14
Observations	31814	23893

Note: Regressions also include controls for survey, service member's military occupation, and detailed paygrade. Robust standard errors in parentheses. Source: Estimations are based on Surveys of Active Duty Personnel conducted in July 2003, March, July, November 2003, April, August, December 2004, March, August, December 2005.

is not the increase in earnings that affects the behavior of spouses but other factors that are associated with deployments. This need not to be surprising, since this is a transitory increase in income.

5.2.6 Effects of Deployments on the Use of Child Care Services

Although the main outcome in this chapter is the spousal labor force participation, I also want to briefly discuss the results for family's use of child care services when the soldier is deployed. When the service member is away from home, the spouse needs to take care of all household duties. Child care may be one of the most demanding of those duties. Since the military households can purchase child care to substitute for service member's and spouse's time at home production, the estimate of the effect of deployment on use of child care service provides information on how spouses respond to deployment. This analysis uses the March 2005 Public Use Status of Forces survey that collected information on whether the spouses are using any child care on- or off-base.[7] In addition, since this variable was not linked to the administrative pay records, the variable for deployment measures whether service member was deployed in the last 12 months in support of the Global War on Terrorism.

Results in Table 5.10 suggest that deployments increase the use on- and off-base child care. Deployments of enlisted personnel increase the use of child care services on-base by 6.8 percentage points, and the use of child care service off-base by 3.3 percentage points. Deployments of officers lead to an increase in the use of child care services on-base by 4.2 percentage points and the use of child care service off-base by 7.3 percentage points. This finding is consistent with the model in which deployments increase demands on spouses, who respond by using more child care services. As a result, the spouses have more time for other household duties that may not have good substitutes on the market.

5.3 Summary and Conclusions

This chapter of the dissertation examines the effect of deployments on spousal labor force participation. The U.S. military often requires service members to deploy away from their families, and these demands increased during the wars in Afghanistan and Iraq. Estimates

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[7]Specific wording was: "For each program or service listed, mark whether you or your family have used it on base (off base) at your present permanent duty location: Child care services."

Table 5.10: Results for Use of Child Care Services

	A. Enlisted		B. Officers	
	On–base	Off–base	On–base	Off–base
	(1)	(2)	(1)	(2)
Deployed	0.068	0.033	0.042	0.073
in the last 12 months	(0.020)	(0.019)	(0.022)	(0.024)
Minority	0.044	-0.002	0.043	0.047
	(0.018)	(0.018)	(0.026)	(0.028)
Educ: Some	0.016	0.016		
College	(0.023)	(0.022)		
Educ: College	0.045	0.043	0.106	0.121
Grad	(0.037)	(0.036)	(0.048)	(0.047)
Svc: Navy	-0.068	0.004	-0.044	0.019
	(0.023)	(0.023)	(0.027)	(0.029)
Svc: Marines	-0.052	0.026	0.053	0.057
	(0.028)	(0.028)	(0.032)	(0.032)
Svc: Ari Force	-0.024	0.028	-0.042	0.014
	(0.025)	(0.024)	(0.028)	(0.029)
Senior	0.035	-0.024	-0.061	-0.019
	(0.022)	(0.021)	(0.022)	(0.023)
Live off base	-0.160	0.122	-0.188	0.116
	(0.020)	(0.018)	(0.028)	(0.023)
Male	-0.127	-0.139	-0.089	-0.109
	(0.041)	(0.040)	(0.041)	(0.044)
Constant	0.425	0.269	0.359	0.083
	(0.049)	(0.048)	(0.067)	(0.068)
Observations	2265	2265	1639	1639

Note: Sample limited to married service members with children. Regressions also include controls for service dummies. Robust standard errors in parentheses. Source: March 2005 survey of Active duty personnel.

from OLS and 2SLS models suggest that the deployment of enlisted service members reduces spousal labor force participation by 2.8 percentage points. Unlike previous studies that examined the effect of deployments only (Angrist and Johnson, 2000), I also examine whether this deployment effect differs by important household characteristics. I find that deployments have a larger effect on spousal labor force participation in families with small children. This is consistent with a theoretical household utility maximization model in which responses to deployment depends on the relative burden of household duties. Spouses have different responses to deployment based on the expected time that service members are away. While spouses do not respond to deployments shorter than 4 months, I find that spouses reduce their labor force participation if the total length of deployment is 5 or more months. This is consistent with a theoretical model under which the costs of searching for a new job prevent the spouse from reacting to short deployments. In addition, I find that spouses reduce their labor supply before service members are deployed. This effect may be due to the reaction of spouses to the increased burden of household duties since service members may spend more time on base when preparing for deployment. Spouses may also take some time to return to the labor force after service members return from deployment.

It is important to recognize the limitations of this analysis. First, this chapter does not

distinguish between different reasons for the deployment effect on spousal labor force participation. The deployment measure used in this study encompasses the effect of time away, increase in income, and additional stress, without distinguishing between each hypothesis. Future work will test the hypothesis that stress affects spousal labor force participation by comparing deployments to combat zones with the deployments to non-combat zones. Second, the scope of this paper is limited to the labor force participation decision of civilian spouses of active duty military personnel, not changes in work hours or earnings. This is arguably an extreme outcome, and not all spouses may respond to deployment by exiting the labor force. Some may simply reduce their work hours, or shift to jobs with more flexible schedules. Future research will use spouse earnings as a proxy for hours of work to examine this effect.

Evidence about the effect of deployment on spousal labor force participation provides one reason why military spouses earn less than comparable spouses of civilian workers. Frequent exits from the labor force is costly to spouses and may reduce their career opportunities. It is not, however, clear whether this evidence warrants a policy intervention. If the deployments are generally anticipated, then the military may not need to worry since the effect simply represents utility maximizing response to the changes in budget constraints. If, however, current level of deployment is unanticipated, then, perhaps, the military needs to consider how to support military spouses.

Chapter 6

Deployment and Retention

While the empirical analysis in the previous chapter suggests that deployments reduce spousal labor force participation, this evidence is not enough to warrant a policy intervention directed at spouses of deployed soldiers. The evidence in chapter 5 suggests that a spouse chooses to exit labor force when the service member is deployed. But we do not know whether this choice is also related to lower household wellbeing. To argue for a policy intervention, we need to show that deployments also have a negative effect on household wellbeing. In other words, we need to demonstrate that deployments make families worse off.

The analysis in this section examines the relationship between deployments and household wellbeing (as revealed in retention outcomes). The unexpected magnitude of the deployments in support of wars in Afghanistan and Iraq raised concerns about a possible effect of deployments on wellbeing of the military families. Policy makers are concerned that long and repeated deployments in support of the operation in Iraq may have negative effects on soldiers' reenlistment behavior. In particular, those soldiers who believe that deployments reduce their family wellbeing would be less likely to stay in the military for another term.

This chapter contributes to an array of studies that explore how deployments affect reenlistment. Qualitative studies suggest that deployments may be very stressful for service members and their families. Some service members who participated in focus groups conducted by Hosek et al. (2006) mentioned that "separation from family was one of the hardest aspects of deployment and caused them to consider leaving the military." Other

service members acknowledged the difficulties imposed by deployment, but also mentioned that these difficulties were not large enough to consider leaving the military. Previous empirical studies find a positive relationship between deployment and reenlistment in the 1990s. Hosek and Totten (2002) find that those service members that have some deployment experience during late 1990s were more likely to reenlist than the service members with no deployments. Hosek and Totten (2002) also find that duration of a non-hostile deployment is not related to the reenlistment rate, while duration of a hostile deployment tends to be associated with lower reenlistment rates. The bottom line is that those service members who experienced deployments were more likely to stay in the military despite the costs that the deployments impose on families. Fricker (2002) finds similar results for officers: those junior and mid-grade officers who were on non-hostile deployments were more likely to stay in the service than those who were not deployed.

Evidence from 2002 and 2003 suggests that deployments may have little direct effect on reenlistment intentions. A study by Hosek et al. (2006) examines the effect of time that service members spend away from home during recent operations in Afghanistan and Iraq. Authors explore the effect of time away from home on such outcomes as service members retention intentions and self-reported level of stress. Using results from focus groups and analysis of the Status of Forces Surveys, authors find that deployments to the operations in Afghanistan and Iraq did not have an effect on service members's intentions to stay in the military, except for Army enlisted and officers, for whom it was associated with a decrease in retention intentions. Hosek et al. (2006) also find that an important variable associated with retention intentions was whether the time away from home was less or more than expected. The service members were less likely to intend to stay in the military when their time away from home was more than expected. Authors also find that frequently working longer than the usual duty-day decreased the intentions to stay in the military.

The positive or no effect of deployments on reenlistment is interesting taking into account the findings in Chapter 5 that deployments reduce spousal labor force participation. This suggest a puzzle about the role of deployments in employment and family wellbeing: even though a deployment shock may lead a spouse to reduce her labor supply, this shock does not affect the overall level of wellbeing (at least not enough to make the family prefer civilian life to the military career).

In the rest of this chapter I explore how deployments affect wellbeing of the military families. Since this dissertation focuses on married service members, I present and discuss results for the effect of deployment on the wellbeing of families in which a service member is married to a civilian spouse. A separate project at the RAND Corporation examines the effect of deployment among all service members. I first examine whether deployments in support of operations in Afghanistan and Iraq are related to soldier's intentions to stay in the military. The final analysis in this chapter examines the relationship between spousal employment and reenlistment. In particular, I examine whether there are some unobserved characteristics that affect both spousal employment and family's wellbeing.

6.1 Empirical Approach

In this section I outline my approach for examining the relationship between deployments and retention outcomes. I use measures of retention intentions derived from surveys as well as actual retention behavior measures derived from administrative records. First, I outline my approach for exploring the association between deployment and retention outcomes. In this analysis I rely on linear regressions, and I describe under what conditions those regressions can reveal the causal effect of deployments on retention outcomes. After that, I describe my approach for exploring the role of spousal employment in retention intentions and outcomes. I model retention outcomes and spousal labor force participation outcomes together in a bivariate probit framework.

6.1.1 Approach for Examining Role of Deployments in Retention

I examine the relationship between deployments and retention outcomes using a basic linear model with the following structure:

$$Y_{it} = \alpha + \gamma D_{it} + \beta X_{it} + \theta_t + \varepsilon_{it} \tag{6.1}$$

Here, the left-hand-side variable Y_i represents service member's retention intentions or retention behavior, α is a constant, and θ_t is a set of survey dummies. The coefficient γ on the dummy variable D_{it} represents the effect of deployments on retention outcome. The retention intentions variable is coded "1" if a service member intends to stay in the mili-

tary, and "0" otherwise. A negative coefficient γ means that a deployment decreases the likelihood that the service member intends to remain in the military. The variable X_{it} represents other covariates, including the service member's age, gender, race, education, AFQT score, paygrade, branch of service, military occupational specialty, years of service, whether time away from home was longer than expected, location in an urban or rural area, county level unemployment rate, number of children, categories of age of the youngest child in the household, and age of the family.

The empirical exercise in this chapter is concerned with predicting retention outcomes. Conceptually this is a descriptive exercise that examines retention intentions or retention behavior by whether a service member was deployed. Under some conditions this exercise may also answer a policy-relevant causal question: how does an increase in deployments affects military families? This causal question may help us understand the consequences of an increase in deployment rates, possible changes in deployment policies or costs for families of deployed personnel. Unlike the descriptive analysis a causal relationship answers a counterfactual question so it is likely to be of value for predicting effects of changes in policies or circumstances, such as the effects of recent periods of high demands on armed forces.

An important condition for a causal interpretation of the estimates from the regression (6.1) is that deployment variable (D_{it}) is uncorrelated with other unobservable characteristics (ε_{it}), or is exogenous. As I have shown in Chapter 5, deployments are in fact exogenous to spousal employment outcomes. Similar arguments for exogeneity of deployments may apply in the case of the retention outcomes. The choice of soldiers for a deployment should not depend on whether these soldiers intend to stay in the military in the future (assuming they are going to be back from the deployment by the time of the reenlistment decision). Service members can not directly affect their chances of being deployed, since they can not volunteer for the deployment. They also cannot refuse to deploy without serious consequences for their career. Although the level of deployment differs between services and by military occupational specialty, once we control for these factors, the deployments should be exogenous to service member's retention intentions.

The analysis in this section parallels a recent study conducted by Hosek et al. (2006), although there are several important differences. First, I use a deployment variable derived

from administrative sources. Furthermore, I concentrate only on the decisions made by married service members, while other studies look at all service members. In addition, I use surveys that were more recent than those used by other authors. This allows me to examine changes in the effect of deployment on retention intentiones over time. Finally, I contribute to the literature by examining the effect of recent deployments to Iraq and Afghanistan on actual reenlistment behaviour. When presenting my findings I emphasize major differences from the previous studies.

6.1.2 Approach for Examining Role of Spousal Employment in Retention

This dissertation also examines the relationship between spousal employment outcomes and service members' retention outcomes. Motivation for this analysis comes from the concern that spousal employment opportunities may play a role in service members' retention outcomes. If, for example, military spouses are unhappy with their employment opportunities, they may induce service members to leave the military.

Since both outcomes (spousal employment and reenlistment) are outcomes of household utility maximization problem, I use a bivariate probit model which explicitly captures possible correlation between the spousal employment and service member's retention outcomes. Those two variables may be distributed jointly, and the value/probability of one depends on the value/probability of the other. An overview of the method is available in Greene (1998a, p.849). Suppose for now that the retention intention variable can be coded as an ordered response variable with two categories: "1" if a service member favors staying on active duty, "0" otherwise. I observe two categorical variables: the service member's intention to stay in the active duty (y_1), and the spousal labor force participation (y_2). Suppose also that y_1^* and y_2^* are unobserved index variables that determine y_1 and y_2 respectively. Suppose that ε_1 and ε_1 are standard normal random variables. These unobserved propensities are defined as:

$$y_1^* = \gamma_1 d + \beta_1' x_1 + \varepsilon_1 = z_a + \varepsilon_1 \qquad y_1 = 1 \text{ if } y_1^* > 0, \quad 0 \text{ otherwise} \quad (6.2)$$

$$y_2^* = \gamma_2 d + \beta_2' x_2 + \varepsilon_2 = z_b + \varepsilon_2 \qquad y_2 = 1 \text{ if } y_2^* > 0, \quad 0 \text{ otherwise} \quad (6.3)$$

$$E(\varepsilon_1) = E(\varepsilon_2) = 0 \qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad (6.4)$$

$$Var(\varepsilon_1) = Var(\varepsilon_2) = 1 \tag{6.5}$$

$$Cov(\varepsilon_1, \varepsilon_2) = \rho \tag{6.6}$$

To estimate the model I need to specify two equations, one for employment and one for retention outcomes. Both outcomes depend on characteristics of a service member, a spouse, and their location. These variables include the service member's age, gender, race, education, AFQT score, paygrade, branch of service, military occupational specialty, years of service, whether time away from home was longer than expected, location in an urban or rural area, county level unemployment rate, number of children, categories of age of the youngest child in the household, and age of the family. I also assume that there may be other factors that influence the spousal employment and the retention outcomes that are known to the service member but are not observed by researchers. These unobserved factors may be included in the variables ε_1 and ε_2. The possible correlation between ε_1 and ε_2 will reveal the relationship between employment and retention outcomes. The probability of both outcomes is modelled jointly using the maximum likelihood approach.

6.2 Results

6.2.1 Deployment in the Month of the Survey and Retention Intentions

Table 6.1 presents the ordinary least squares (OLS) estimates of the relationship between deployment in the month of the survey and service member's intentions to stay in the military (coded "1" if service member responds that he or she is likely or very likely to stay in the military). Panel A includes estimates for enlisted personnel married to civilian spouses and Panel B presents estimates for officers married to civilian spouses. Since some service members appear in the data in several surveys, I cluster all standard errors on the individual spouse using Huber-White robust standard errors.

The estimates of γ for enlisted personnel suggest that those service members who are deployed to a war zone are 2.6 percentage points less likely to intend to stay in the military for another term (Table 6.1, Panel A, Column 1). Since about 64 percent of service members respond that they intend to stay in the military, this corresponds to a 4 percent decrease in the retention intentions associated with a hostile deployment. Similar relation-

ship holds between retention intentions and variables that capture exposure to deployments over a time period (whether a service member was deployed in the last 12 months, deployed since September 11, 2001, fraction of time deployed since September 11, 2001, and months deployed since September 11, 2001).[1] These specifications address a possible concern that a deployment may have a lagged effect on reenlistment intentions. For instance, those service members who were recently deployed may have lower retention intentions than those service members who were not deployed at all. Although the retention intensions are measured at some point of time, the retention decision may take into account a history of deployments, and not only whether the service member was deployed at a particular point in time.

The effect of deployment on retention intentions disappears once we control for differences between actual and expected time away from home. Specification in Column 2 of Table 6.1 follows the analysis in Hosek et al. (2006) by controlling for whether a soldier's time away from home was more or less then expected. This set of variables captures the extent of deviation between actual and expected deployment duration. Most people who join the military expect to spend some time away from home for military duties. Consistent with the results in Hosek et al. (2006) I find that those service members who were away for more than expected were 4.7 percentage points less likely to intend to stay and those who spend much more time away from home than expected were 13.6 percentage points less likely to respond that they intend to stay in the military for another term. Once I control for whether the soldier's time away from home was less or more than expected, the estimated effect of deployment becomes statistically indistinguishable from zero. Consistent with the existing literature and with the economic model presented in Hosek et al. (2006), these findings suggest that the soldier's intentions to remain in the military are affected by deviations in the actual deployment time from the expected deployment duration. Overall, my estimates of the effect of deployment on retention intentions confirm findings in Hosek et al. (2006), even though I use a different definition of deployment and limit the analysis to married service members.

Specification (3) in Table 6.1 adds controls for non–hostile deployments and instances of overtime work. The coefficient on the non-hostile deployment variable is not statistically different from zero, which suggests that those service members who are on non-hostile

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[1]These results are not presented here and are available upon request.

Table 6.1: OLS Estimates of the Effect of Deployment on Retention Intentions

	A. Enlisted			B. Officers		
	(1)	(2)	(3)	(1)	(2)	(3)
On Hostile Deployment	-0.026	0.004	0.008	-0.027	-0.002	0.006
	(0.010)	(0.010)	(0.011)	(0.012)	(0.012)	(0.012)
On Non-Hostile Deployment			0.000			0.047
			(0.010)			(0.014)
Away much less than expected		-0.009	-0.014		-0.012	-0.017
		(0.009)	(0.009)		(0.013)	(0.013)
Away less than expected		-0.003	-0.005		-0.007	-0.010
		(0.008)	(0.008)		(0.008)	(0.008)
Away more than expected		-0.047	-0.040		-0.027	-0.021
		(0.008)	(0.008)		(0.008)	(0.008)
Away much more than expected		-0.136	-0.122		-0.138	-0.130
		(0.009)	(0.009)		(0.012)	(0.012)
Days worked overtime: 21–60			-0.042			-0.014
			(0.007)			(0.009)
Days worked overtime: 61–120			-0.054			-0.027
			(0.008)			(0.009)
Days worked overtime: over 120			-0.072			-0.053
			(0.007)			(0.008)
Log of monthly earnings	0.007	0.008	0.012	-0.043	-0.044	-0.042
	(0.011)	(0.011)	(0.011)	(0.010)	(0.010)	(0.010)
Senior	0.060	0.060	0.064	-0.035	-0.037	-0.035
	(0.010)	(0.010)	(0.010)	(0.008)	(0.008)	(0.008)
SVC: Navy	0.109	0.105	0.098	0.047	0.042	0.038
	(0.007)	(0.007)	(0.007)	(0.008)	(0.008)	(0.008)
SVC: Marines	0.074	0.065	0.064	0.011	0.005	0.006
	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)
SVC: Air Force	0.126	0.116	0.110	0.042	0.038	0.037
	(0.009)	(0.009)	(0.009)	(0.008)	(0.008)	(0.008)
Live on Base	-0.043	-0.043	-0.043	-0.060	-0.061	-0.062
	(0.006)	(0.006)	(0.006)	(0.007)	(0.007)	(0.007)
Live in Metro Area	-0.003	-0.003	-0.005	-0.001	0.000	-0.000
	(0.007)	(0.007)	(0.007)	(0.008)	(0.008)	(0.008)
Live Outise CONUS	0.003	0.002	0.005	0.014	0.017	0.022
	(0.010)	(0.010)	(0.010)	(0.011)	(0.011)	(0.011)
Age of the Spouse	-0.001	-0.001	-0.001	-0.003	-0.003	-0.003
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Black	-0.002	-0.002	-0.008	0.022	0.024	0.018
	(0.007)	(0.007)	(0.007)	(0.010)	(0.010)	(0.010)
Hispanic	0.016	0.019	0.017	0.026	0.028	0.025
	(0.008)	(0.008)	(0.008)	(0.014)	(0.014)	(0.014)
Other	0.037	0.042	0.039	0.014	0.016	0.015
	(0.009)	(0.009)	(0.009)	(0.012)	(0.012)	(0.012)
Number of Children	0.002	0.002	0.001	-0.009	-0.009	-0.009
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Age of Youngest child: under 1	0.058	0.059	0.058	0.040	0.038	0.037
	(0.012)	(0.012)	(0.012)	(0.013)	(0.013)	(0.013)
Age of Youngest child: 1–5	0.047	0.049	0.049	0.047	0.048	0.047
	(0.009)	(0.009)	(0.009)	(0.011)	(0.011)	(0.011)
Age of Youngest child: 6–12	0.039	0.040	0.039	0.030	0.030	0.030
	(0.010)	(0.010)	(0.010)	(0.012)	(0.012)	(0.012)
Age of Youngest child: over 13	-0.007	-0.006	-0.006	0.010	0.010	0.011
	(0.013)	(0.013)	(0.013)	(0.012)	(0.012)	(0.012)
Male	0.025	0.030	0.037	-0.002	-0.001	-0.002
	(0.010)	(0.010)	(0.010)	(0.011)	(0.011)	(0.011)
County UR	0.000	-0.000	0.000	-0.001	-0.000	0.000
	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)
Family Age: 1–3	0.005	0.005	0.005	-0.003	-0.002	-0.000
	(0.008)	(0.008)	(0.008)	(0.012)	(0.012)	(0.012)
Family Age: 4–6	0.018	0.019	0.018	-0.003	-0.003	-0.001
	(0.009)	(0.009)	(0.009)	(0.012)	(0.012)	(0.012)
Family Age: over 6	0.006	0.008	0.008	0.023	0.023	0.025
	(0.008)	(0.008)	(0.008)	(0.009)	(0.009)	(0.009)
YOS: 4–6	-0.044	-0.043	-0.041	0.042	0.042	0.048
	(0.011)	(0.011)	(0.012)	(0.017)	(0.017)	(0.017)
YOS: 7–10	0.025	0.023	0.026	0.205	0.204	0.212
	(0.014)	(0.014)	(0.014)	(0.015)	(0.015)	(0.015)
YOS: over 11	0.075	0.072	0.076	0.308	0.309	0.316
	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)
First Term	-0.181	-0.179	-0.181			
	(0.012)	(0.012)	(0.012)			
Second Term	-0.038	-0.038	-0.039			
	(0.007)	(0.007)	(0.007)			
AFQT: I–IIIA	-0.020	-0.022	-0.015			
	(0.006)	(0.006)	(0.006)			
Educ: HS Grad	0.038	0.039	0.039			
	(0.008)	(0.008)	(0.008)			
Educ: College Grad				0.015	0.015	0.015
				(0.013)	(0.013)	(0.013)
Constant	0.495	0.510	0.509	0.820	0.843	0.844
	(0.086)	(0.086)	(0.087)	(0.131)	(0.128)	(0.128)
Observations	31400	31088	30673	23695	23595	23348
R-squared	0.09	0.10	0.10	0.06	0.06	0.06

Note: Regressions also include controls for survey, service member's military occupation, and detailed paygrade. Robust standard errors in parentheses. Source: Estimations are based on Surveys of Active Duty Personnel conducted in July 2003, March, July, November 2003, April, August, December 2004, March, August, December 2005.

deployments are not different in their retention intentions from those who are not deployed. I also find that overtime work was negatively correlated with retention intentions. Those enlisted service members who worked over 120 days overtime in the last 12 months were about 7 percentage points less likely to respond that they would choose to stay in the military compared to those service members who had less than 20 days of overtime work. This finding is consistent with the household utility maximization model in which the soldier's hours of work are not compensated and the direct satisfaction with the job is not enough to outweigh this negative effect. This effect is also consistent with the findings in Hosek et al. (2006) for the sample of all service members, and with findings in Huffman et al. (2001) that long hours of work are important reasons for leaving the military.

Factors other than deployments are also related to soldiers' intentions to stay in the military. The estimates suggest that, after controlling for other characteristics, service members with small children are more likely to intend to stay in the military; service members in their first term of enlistment are less likely to respond that they intend to remain in the military; service members with over 10 years of service are more likely to intend to stay in the military for another term.

Patterns of the deployment effects for officers are similar to what we find for enlisted personnel (Panel B of Table 6.1). I find that deployments reduce officer's intentions to stay in the military by 2.7 percentage points. This effect, however, disappears once we control for whether officers were away longer than expected.

6.2.2 Effect of Deployment on Retention Behavior

Estimates in Table 6.2 examine the relationship between deployments and reenlistment behavior. Since a reenlistment decision may take place long after a survey, I make several changes to the analysis. First, I use a deployment variable which identifies whether a service member had any deployments in support of operations in Afghanistan and Iraq. This variable takes into account a possibility that the reenlistment decision may happen long after the service member returns from the deployment. Second, the sample includes only enlisted personnel, since the reenlistment decision can not be easily defined for officers. Third, the sample is limited only to those service members who have under two years left on their contract. Since this creates a non-random sample of service members (because

different services have different contact durations) I reweigh my estimates to make them comparable to all service members. The results are similar to what we get from the sample of all service members with observed reenlistment choice. To accommodate this non-random change in the sample, I also present results for an intentions retention variable from the survey.

Estimates in Table 6.2 suggest that deployments increase a soldier's propensity to stay in the military after an end of an enlistment contract. The specification in Panel A of Table 6.2 examines the relationship between deployment and reenlistment, coded "1" if a service member signs a new contract of over 24 months, and "0" if the service member leaves the service or extends the contract by less then 24 months. The estimates suggest that those service members who had any deployments to Afghanistan or Iraq after September 11, 2001, were 2.3 percentage points more likely to reenlist at the end of their contract. Specification in Panel B of Table 6.2 examines the relationship between deployments and a variable that captures whether a service member stayed in the military at the end of the enlistment term. This variable is coded "1" if the service member stays on active duty after the end of the enlistment term (by reenlisting or extending the contract), and "0" if the service member leaves the military. The positive coefficient on the deployment variable means that those service members who experience deployments were more likely to stay in the military when their contract expired. I find that those service members who were deployed after September 11, 2001 were 3.9 percentage points more likely to remain in the military (less likely to leave) when their enlistment term ended. This relationship is very different from what we find in the intentions to reenlist regressions, which are re-estimated on the same sample in Panel C of Table 6.2. Even though deployments are negatively correlated with intentions to stay in the military, they are positively correlated with reenlistment behavior. A separate project at the RAND Corporation suggest that reenlistment bonuses may pay an important role in this pattern of results.

6.2.3 Deployment Effects by Household and Deployment Characteristics

The deployment effect also differs by household characteristics. Panel I of Table 6.3 presents the estimates of the deployment effect interacted with the presence of children in different age categories. I present these results for three outcomes of interest: whether a service

Table 6.2: OLS Estimates of the Deployment Effect on Retention Behavior and Reenlistment Intentions

Dependent Variable:	A. Reenlisted	B. Stayed	C. Intend to Reenlist
	(1)	(2)	(3)
Deployed since 9/11/2001	0.023	0.039	-0.021
	(0.009)	(0.009)	(0.009)
Senior	0.106	0.119	0.045
	(0.013)	(0.014)	(0.014)
AFQT: I–IIIA	0.008	-0.004	-0.033
	(0.009)	(0.009)	(0.009)
SVC: Navy	-0.034	0.053	0.148
	(0.011)	(0.012)	(0.012)
SVC: Marines	0.028	-0.027	0.076
	(0.011)	(0.012)	(0.012)
SVC: Air Force	0.184	0.168	0.132
	(0.013)	(0.013)	(0.013)
Educ: HS Grad	0.057	0.077	0.047
	(0.011)	(0.012)	(0.012)
Black	-0.006	0.016	0.025
	(0.010)	(0.011)	(0.011)
Hispanic	0.002	0.038	0.034
	(0.012)	(0.013)	(0.012)
Other	0.010	0.045	0.077
	(0.014)	(0.015)	(0.014)
Number of Children	-0.000	0.002	0.002
	(0.005)	(0.005)	(0.005)
Age of Youngest child: under 1	0.069	0.087	0.079
	(0.018)	(0.018)	(0.018)
Age of Youngest child: 1–5	0.064	0.088	0.057
	(0.014)	(0.015)	(0.015)
Age of Youngest child: 6–12	0.038	0.027	0.031
	(0.016)	(0.017)	(0.016)
Age of Youngest child: over 13	-0.081	-0.122	-0.027
	(0.017)	(0.019)	(0.019)
Family Age: 1–3	0.016	0.014	-0.005
	(0.013)	(0.014)	(0.014)
Family Age: 4–6	0.027	0.020	0.024
	(0.016)	(0.016)	(0.016)
Family Age: over 6	0.005	-0.017	0.012
	(0.016)	(0.016)	(0.016)
Male	0.032	0.063	0.049
	(0.014)	(0.015)	(0.015)
YOS: 4–6	-0.084	-0.070	-0.036
	(0.014)	(0.015)	(0.015)
YOS: 7–10	-0.076	-0.089	0.023
	(0.020)	(0.021)	(0.021)
YOS: over 11	-0.207	-0.201	0.076
	(0.023)	(0.024)	(0.024)
First Term	-0.162	-0.189	-0.135
	(0.017)	(0.018)	(0.018)
Second Term	-0.056	-0.052	-0.052
	(0.011)	(0.012)	(0.012)
Constant	0.194	0.416	0.370
	(0.033)	(0.035)	(0.035)
Observations	13574	13574	13574
R-squared	0.07	0.07	0.10

Note: Regressions also include controls for survey, service member's military occupation, and detailed paygrade. Robust standard errors in parentheses. Source: Estimations are based on Surveys of Active Duty Personnel conducted in July 2003, March, July, November 2003, April, August, December 2004, March, August, December 2005.

member reenlisted at the end of the term, whether a service member stayed in the military at the end of the term, and whether a service member intends to stay in the military. In families with no children deployments have little effect on reenlistment, while in families with children deployments are positively related to reenlistment. This pattern of results may reflect a selective nature of retention and childbearing among military families. Families with no children include younger families who have only recently joined the military. These families are still learning about the hardships of the military life and whether they would like to stay in the military. Families with children, however, may have already spent some time in the military. They may have experienced deployments before, and may have learned about possible benefits and hardships of the military life. These families also decided to bring a child into a military family despite the hardships that the military life imposes. In addition, these families may value the benefits and support that the military provides for families with children. Furthermore, most of them have been in the military for a while and have had chances to leave the military while making previous reenlistment decisions.

Table 6.3: Estimates of Deployment Effects on Reenlistment by Household Characteristics

	A. Reenlisted	B. Stayed	C. Intent to stay
	(1)	(2)	(3)
I. Age of Youngest Child			
no children	0.001	0.009	-0.028
	(0.015)	(0.017)	(0.016)
under 5 years old	0.011	0.021	-0.037
	(0.013)	(0.013)	(0.013)
6 to 12 years	0.064	0.079	0.017
	(0.019)	(0.020)	(0.018)
over 12 years	0.057	0.138	-0.004
	(0.025)	(0.030)	(0.029)
II. Term of Service			
first term	0.018	-0.003	-0.035
	(0.014)	(0.015)	(0.015)
second term	0.006	0.045	-0.016
	(0.015)	(0.016)	(0.016)
beyond the second term	0.042	0.078	-0.012
	(0.014)	(0.015)	(0.014)
III. Reenlistment with a spouse			
first reenlistment	-0.003	-0.002	-0.038
	(0.012)	(0.013)	(0.012)
beyond the first reenlistment	0.043	0.079	-0.004
	(0.012)	(0.012)	(0.012)
IV. Gender of the service member			
female	0.095	0.111	0.008
	(0.030)	(0.031)	(0.031)
male	0.017	0.033	-0.024
	(0.009)	(0.009)	(0.009)
Observations	13574	13574	13574

Note: Regressions also include controls for whether service member was deployed for longer than expected, the number of days working overtime, log of monthly earnings, service, paygrade, whether lived on base, age of spouse, service member's race, number of children, presence of children in different age categories, years of service, AFQT, term of service, education, survey, service member's military occupation, and detailed paygrade. Robust standard errors in parentheses. Source: Estimations are based on Surveys of Active Duty Personnel conducted in July 2003, March, July, November 2003, April, August, December 2004, March, August, December 2005.

The deployment effect also depends on soldiers' terms of enlistment. The estimates in Panel II of Table 6.3 suggest that the deployments effects are not different from zero for the service members in the first term of enlistment. At the same time, deployments are strongly associated with staying in the military among service members who are in their second or beyond the second term of enlistment. Among the service members in second term of enlistment, deployments lead to 4.5 percentage points increase in likelihood of staying in the service after the enlistment term is over. This finding is consistent with selective separation or retention based on taste or preference for deployments. Families in the first term of enlistment learn about the hardships of the military life, especially the difficulties of deployments. At the end of the first term, those families who find that the hardships of the military life were too much to handle are more likely to leave the military. Those families who stay beyond the first term are a selected set of families who are willing to stay in the military despite the hardships that it may impose on families.

6.2.4 Relationship between Spousal Employment and Retention

The analysis in the rest of this chapter explores the relationship between spousal employment and family wellbeing. This analysis is motivated by a concern that the military's constraints on spousal employment opportunities may have a negative effect on reenlistment. In particular, many policy makers are worried that military life may constrain spousal ability to maintain a career, which, in turn, may make spouses less happy with the military. Spouses who are not satisfied with their career opportunities while they are in the military may lobby service members to leave the force and become a civilian family. As a result, those spouses who have better career opportunities outside the military or have higher taste for work would be more likely to leave the military.

The evidence about the relationship between spousal employment opportunities and retention outcomes is limited. The only study that explores the correlation between spousal employment and retention suggests that soldiers are more likely to leave the service if their spouses are unemployed (Wood, 1988). But this study does not establish a causal effect of spousal employment on reenlistment, it just provides an evidence of the correlation between spousal employment and reenlistment, which may be driven by many other factors that are unobserved to researchers. Stories in the news also suggest that spouses may like the

employment opportunities available to them in the civilian market. "Now, many officer's wives (or, in the case of female officers, their husbands) have their own careers; they don't want to spend years in Fort Riley, Kan., then a few years more in Fort Hood, Texas. And at some point in the tradeoff between private and professional lives, the officer gives in to his or her spouse, takes a stable job, buys a house, and gets out of the service" (Kaplan, 2008).

Table 6.4 provides the OLS estimates of the relationship between spousal employment and service member's intentions to stay in the military. Panel A of Table 6.4 includes estimates for enlisted service members and Panel B includes estimates for officers. These results suggest that the spousal labor force participation is negatively related to the service member's intentions to stay in the military. Soldiers with the spouses in labor force are 2.7 percentage points less likely to intend to stay in the military for another term. It should be emphasized that these results can not be interpreted as a causal effect of spousal employment on household wellbeing. Since both spousal employment and family retention decisions are choices that families make to maximize their wellbeing, the estimated coefficients provide information only about correlation between those two measures.

Table 6.4: OLS Estimates of Correlation Between Employment Outcomes and Service Member's Intentions to Stay in the Military

	A. Enlisted		B. Officers	
	(1)	(2)	(1)	(2)
In Labor Force	-0.028		-0.039	
	(0.006)		(0.006)	
Employed		-0.032		-0.038
		(0.006)		(0.007)
Unemployed		-0.009		-0.043
		(0.009)		(0.013)
Deployed Now	-0.024	-0.023	-0.029	-0.029
	(0.010)	(0.010)	(0.012)	(0.012)
Observations	30959	30959	21123	21123
R-squared	0.09	0.09	0.06	0.06

Note: Regressions also include controls for whether service member was deployed for longer than expected, the number of days working overtime, log of monthly earnings, service, paygrade, whether lived on base, age of spouse, service member's race, number of children, presence of children in different age categories, years of service, AFQT, term of service, education, survey, service member's military occupation, and detailed paygrade. Robust standard errors in parentheses. Source: Estimations are based on Surveys of Active Duty Personnel conducted in July 2003, March, July, November 2003, April, August, December 2004, March, August, December 2005.

Spousal employments is also negatively related to soldier's decision to stay in the military. Table 6.5 provides the estimates of the correlation between spousal employment and service member's reenlistment behavior. These results suggest that service members were less likely to stay in the military if their spouses were in labor force at the time of the

survey.

Table 6.5: OLS Estimates of Correlation Between Employment Outcomes and Service Member's Reenlistment

Dependent Variable:	A. Reenlisted		B. Stayed		C. Intend to Reenlist	
	(1)	(2)	(1)	(2)	(1)	(2)
Spouse in Labor Force	-0.034		-0.035		-0.021	
	(0.009)		(0.009)		(0.009)	
Spouse Employed		-0.035		-0.039		-0.025
		(0.009)		(0.009)		(0.009)
Spouse Unemployed		-0.030		-0.013		0.005
		(0.015)		(0.015)		(0.015)
Deployed since 9/11/2001	0.021	0.021	0.037	0.036	-0.024	-0.024
	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)
Observations	13508	13508	13508	13508	13508	13508
R-squared	0.06	0.06	0.07	0.07	0.09	0.09

Note: Regressions also include controls for whether service member was deployed for longer than expected, the number of days working overtime, log of monthly earnings, service, paygrade, whether lived on base, age of spouse, service member's race, number of children, presence of children in different age categories, years of service, AFQT, term of service, education, survey, service member's military occupation, and detailed paygrade. Robust standard errors in parentheses. Source: Estimations are based on Surveys of Active Duty Personnel conducted in July 2003, March, July, November 2003, April, August, December 2004, March, August, December 2005.

Table 6.6 presents estimates from the bivariate probit regression that models spousal employment and reenlistment intentions jointly as a system of equations. This specification provides an advantage over the separate regressions for spousal labor force participation (see Chapter 5) and reenlistment intentions or behavior (presented above), since it allows us to estimate a correlation in unobservable variables that affect both spousal labor force participation and family wellbeing. The coefficient of correlation (ρ) between the spousal labor force participation decision and service members intention to stay in the military is negative and significantly different from zero. The negative correlation indicates that the decision of the spouse to be in labor force decreases the likelihood that the service member intends to stay in the military. This suggests that an unobserved taste for work is negatively correlated with reenlistment. The estimates suggest that those spouses who have a high taste for employment are less likely to stay in the military. This is consistent with findings in Hosek et al. (2002) that time in the military is negatively correlated with spousal employment, and that spousal labor force participation decreases with age.

The correlation between spousal employment and reenlistment outcomes differs by the service member's term of service. Column A of Table 6.7 provides the estimates of the correlation between spousal labor force participation and reenlistment behavior by term of service. These results suggest that the negative correlation between the spousal labor force participation and the service member's decision to remain in the military is limited

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Table 6.6: Bivariate Probit Estimates for Intentions to Stay in the Military and Spousal Labor Force Participation

	A. Enlisted				B. Officers			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
On Hostile Deployment	0.031	-0.068			0.019	-0.019		
	(0.030)	(0.030)			(0.037)	(0.036)		
On Non-Hostile Deployment	-0.004	-0.002			0.156	-0.037		
	(0.029)	(0.029)			(0.050)	(0.047)		
Deployed to GWOT			0.029	-0.070			0.051	-0.099
			(0.019)	(0.019)			(0.025)	(0.024)
Away much less than expected	-0.045	0.075	-0.053	0.073	-0.062	0.059	-0.075	0.049
	(0.028)	(0.028)	(0.027)	(0.027)	(0.043)	(0.041)	(0.042)	(0.041)
Away less than expected	-0.017	0.032	-0.011	0.022	-0.034	0.071	-0.041	0.069
	(0.024)	(0.024)	(0.024)	(0.024)	(0.027)	(0.025)	(0.027)	(0.025)
Away more than expected	-0.119	-0.002	-0.129	0.003	-0.071	0.040	-0.075	0.060
	(0.023)	(0.022)	(0.022)	(0.022)	(0.026)	(0.025)	(0.026)	(0.025)
Away much more than expected	-0.340	-0.004	-0.352	0.014	-0.389	0.049	-0.393	0.078
	(0.026)	(0.026)	(0.026)	(0.026)	(0.034)	(0.034)	(0.034)	(0.034)
Days worked overtime: 21–60	-0.127	0.069	-0.125	0.067	-0.048	0.109	-0.035	0.106
	(0.022)	(0.022)	(0.022)	(0.021)	(0.032)	(0.030)	(0.032)	(0.030)
Days worked overtime: 61–120	-0.161	0.092	-0.157	0.095	-0.086	0.087	-0.079	0.091
	(0.024)	(0.024)	(0.024)	(0.024)	(0.032)	(0.030)	(0.032)	(0.030)
Days worked overtime: over 120	-0.212	0.088	-0.206	0.089	-0.175	0.110	-0.150	0.105
	(0.021)	(0.021)	(0.021)	(0.020)	(0.028)	(0.027)	(0.028)	(0.026)
Log of monthly earnings	0.031	0.040			-0.132	-0.080		
	(0.031)	(0.031)			(0.032)	(0.030)		
Log of yearly earnings			-0.064	0.090			-0.290	-0.091
			(0.037)	(0.037)			(0.033)	(0.033)
Senior	0.181	0.005	0.184	-0.002	-0.129	-0.059	-0.051	-0.086
	(0.027)	(0.027)	(0.026)	(0.026)	(0.029)	(0.027)	(0.033)	(0.031)
SVC: Navy	0.283	0.019	0.263	0.027	0.119	-0.004	0.126	0.023
	(0.022)	(0.021)	(0.021)	(0.021)	(0.028)	(0.026)	(0.027)	(0.026)
SVC: Marines	0.187	0.105	0.168	0.104	0.015	0.020	0.009	0.041
	(0.023)	(0.023)	(0.023)	(0.023)	(0.027)	(0.027)	(0.027)	(0.025)
SVC: Air Force	0.312	0.090	0.299	0.101	0.115	-0.124	0.112	-0.113
	(0.025)	(0.025)	(0.026)	(0.026)	(0.026)	(0.025)	(0.026)	(0.025)
Live on Base	-0.124	0.090			-0.208	0.208		
	(0.018)	(0.017)			(0.024)	(0.022)		
Live in Metro Area	-0.015	0.055	-0.061	0.229	-0.003	0.042	-0.121	0.275
	(0.020)	(0.020)	(0.021)	(0.020)	(0.026)	(0.024)	(0.028)	(0.026)
Live Outise CONUS	0.018	-0.174			0.074	-0.243		
	(0.028)	(0.028)			(0.036)	(0.034)		
Age of the Spouse	-0.004	-0.002			-0.010	-0.011		
	(0.002)	(0.002)			(0.002)	(0.002)		
Black	-0.024	0.262	-0.014	0.240	0.058	0.411	0.064	0.391
	(0.020)	(0.020)	(0.020)	(0.020)	(0.034)	(0.033)	(0.034)	(0.033)
Hispanic	0.051	-0.056	0.057	-0.064	0.083	0.012	0.072	0.023
	(0.024)	(0.023)	(0.023)	(0.023)	(0.046)	(0.044)	(0.045)	(0.043)
Other	0.120	-0.011	0.130	-0.045	0.050	-0.072	0.073	-0.091
	(0.029)	(0.028)	(0.028)	(0.027)	(0.040)	(0.039)	(0.040)	(0.039)
Number of Children	0.006	0.015	0.007	0.009	-0.028	-0.036	-0.024	-0.033
	(0.009)	(0.009)	(0.009)	(0.009)	(0.010)	(0.010)	(0.010)	(0.010)
Age of Youngest child: under 1	0.154	-0.883	0.179	-0.852	0.120	-1.103	0.162	-1.096
	(0.033)	(0.033)	(0.033)	(0.032)	(0.042)	(0.042)	(0.042)	(0.041)
Age of Youngest child: 1–5	0.134	-0.578	0.155	-0.548	0.156	-0.821	0.192	-0.815
	(0.027)	(0.027)	(0.026)	(0.026)	(0.035)	(0.034)	(0.035)	(0.033)
Age of Youngest child: 6–12	0.103	-0.156	0.116	-0.133	0.093	-0.285	0.114	-0.301
	(0.031)	(0.031)	(0.030)	(0.030)	(0.037)	(0.036)	(0.037)	(0.035)
Age of Youngest child: over 13	-0.036	-0.023	-0.033	-0.023	0.030	0.052	0.021	-0.018
	(0.037)	(0.038)	(0.035)	(0.036)	(0.038)	(0.037)	(0.036)	(0.035)
Male	0.106	-0.295	0.135	-0.254	-0.008	-0.587	0.055	-0.541
	(0.029)	(0.031)	(0.027)	(0.030)	(0.036)	(0.037)	(0.034)	(0.036)
County UR	0.000	-0.008			0.001	-0.018		
	(0.004)	(0.004)			(0.005)	(0.005)		
First Term	-0.489	0.087	-0.487	0.098				
	(0.031)	(0.032)	(0.031)	(0.031)				
Second Term	-0.123	0.044	-0.120	0.048				
	(0.021)	(0.020)	(0.020)	(0.020)				
AFQT: I–IIIA	-0.042	0.029	-0.041	0.032			0.142	-0.014
	(0.018)	(0.017)	(0.017)	(0.017)			(0.031)	(0.029)
Educ: HS Grad	0.110	-0.022						
	(0.022)	(0.022)						
Educ: College Grad			-0.176	0.032	0.042	-0.130	0.103	-0.107
			(0.032)	(0.032)	(0.044)	(0.042)	(0.046)	(0.045)
Educ: Some College			-0.076	0.017			0.143	0.121
			(0.026)	(0.026)			(0.116)	(0.106)
Constant	0.052	0.267	0.878	-0.640	1.145	2.161	2.647	1.902
	(0.253)	(0.248)	(0.381)	(0.382)	(0.373)	(0.367)	(0.440)	(0.443)
Observations	30528	30528	31629	31629	23283	23283	23580	23580
ρ	-0.046		-.044		-.068		-.075	
	.010		.010		.012		.012	
χ^2	20.823		20.02		32.341		40.504	
	0.000		0.000		0.000		0.000	

Note: Regressions also include controls for survey, service member's military occupation, detailed paygrade, family age, years of service. Robust standard errors in parentheses. Source: Estimations are based on Surveys of Active Duty Personnel conducted in July 2003, March, July, November 2003, April, August, December 2004, March, August, December 2005.

only to those families who are in their first or second term of enlistment. In particular, the first term service members are about 6.4 percentage points less likely to reenlist if their spouses are in the labor force at the time of the survey, while the effects for the service members who are beyond their second term are not different from zero. Similar patterns hold if I use an indicator of whether the service member left the military as my outcome of interest (Column B of Table 6.7). Spousal labor force participation is associated with a lower likelihood of staying in the military among the first term personnel, but the estimates are not statistically different from zero among service members who are beyond the second term of enlistment.

Table 6.7: Correlation between Spousal Employment and Reenlistment by Term of Service

Dependent Variable:	A. Reenlisted	B. Left	C. Intend to Reenlist
First Term	-0.069	-0.077	-0.045
	(0.013)	(0.014)	(0.013)
Second Term	-0.039	-0.028	-0.031
	(0.012)	(0.012)	(0.012)
Beyond Second Term	0.010	0.009	0.005
	(0.012)	(0.013)	(0.011)
Constant	0.153	0.382	0.372
	(0.032)	(0.034)	(0.032)
Observations	13574	13574	14881
R-squared	0.06	0.07	0.10

Note: Regressions also include controls for survey, service member's military occupation, detailed paygrade, family age, years of service. Robust standard errors in parentheses. Source: Estimations are based on Surveys of Active Duty Personnel conducted in July 2003, March, July, November 2003, April, August, December 2004, March, August, December 2005.

The results in Table 6.7 are consistent with several hypothesis. First of all, the negative correlation between spousal employment and reenlistment does not imply a causal effect of spousal employment on a subsequent reenlistment decision. Spousal employment is not an exogenous variable, but rather a choice that spouses make based on some observable and unobservable characteristics. One of the unobserved characteristics that may affect this relationship is the spousal taste for employment. Spouses who marry into the military may differ in terms of their taste for work and career. Furthermore, they may not know the full extent of the effects of the military life on the spousal ability to maintain their career. Once the spouse becomes a part of the military family, he or she learns about the constraints that the military life imposes on the household. Those spouses who believe that the military imposes large constraints on their ability to develop a career may induce service members to leave the service. As a result, we may expect that those spouses who have high taste for work may encourage service members to leave the military at the first opportunity. This

selection also insures that those families to decided to stay in the military at least once would be less sensitive to the spousal employment and career inspirations.

6.3 Summary and Conclusions

This chapter of the dissertation provides several findings important for understanding the role of deployments in the military families. First, I find that deployments have little effect on intentions to stay in the military and have a positive effect on reenlistment behavior. Those service members who experienced some deployments since September 11, 2001 were more likely to reenlist than the service members who were not deployed. My results also support the findings by Hosek et al. (2006) that it is not just an absence from home that matters for service members and family retention intentions but whether the service members spend more or less time away from home than expected.

I also find that the effect of deployment may differ by household characteristics. I find that deployments are negatively correlated with retention intentions only among the first term married enlisted service members. This is consistent with a theoretical model under which service members learn about the hardships of the military life early in the career, and they tend not to respond to those hardships once they made the first reenlistment decision.

The role of deployment shocks in spousal employment and reenlistment behavior highlights an importance of the selection stories mentioned in Chapter 3. By the time most service members decide to marry, they might have learned about the hardships that the military life imposes on families, and they are willing to start a family despite these hardships. Second, the spouses who decide to marry into the military may expect the hardships that the military service imposes on families and be willing to become a military spouse despite all the difficulties that the military life imposes on families. Furthermore, some people may marry with the expectation that the service member will leave the military when his or her contract expires. Finally, those families who have been in the military for a while are a selected sample, since they have already chosen to reenlist. Over time they have learned about the military life and they may be the ones who are better accustomed to the hardships that the military life imposes on families.

I also find a negative correlation between spousal employment and reenlistment. This

analysis is motivated by the different effects that deployments has on spousal labor force participation and on family wellbeing. While deployments reduce spousal labor force participation, they may increase family wellbeing (measured by retention intentions). This suggests that spouses may reduce their labor supply as an optimal utility maximizing response to time that service members spend away from home. This response does not imply that families are worse off as a result of deployment. Service members who experienced deployments are more likely to respond that they intend to stay in the military (at least for medium length deployments). Furthermore, the analysis suggest that those spouses who are not satisfied with their career options while in the military tend to separate from the military early and there is little relationship between spousal employment and reenlistment among those families that decided to stay in the military.

Chapter 7

Conclusions

7.1   Reflections on the Findings

This dissertation examines how families respond to temporary shocks that affect time with the household and earnings. In particular, this analysis explores the effects of deployments to Afghanistan and Iraq on spousal labor supply and household wellbeing. An important feature of deployments is that they provide an exogenous and unanticipated shock to the household production activities. First, deployments limit the time that a service member spends with the family, and change a household into a single-parent family where the spouse has to perform all household duties. Second, deployments increase the level of personal stress in the family. The spouses may be worried about their loved ones being at harms way. They do not know for how long the service member will be gone, when he or she is coming back, and whether the service member would have to deploy again only after a short period of time at home base. Finally, deployments lead to higher household earnings. My estimates suggest that deployments may increase soldiers' earnings by 20 percent, and this factor may counteract the other negative effects of deployment.

This study is also motivated by the concerns that the military may impose significant constraints on families. Many existing studies suggest that the nature of the military life may constrain spousal ability to maintain stable employment and develop a career. These studies find that the spouses of military personnel have worse labor market outcomes than the comparable spouses of civilian workers, and they cite frequent moves as a major factor in this relationship. My dissertation contributes to this literature by considering the

constraints on military families that were overlooked in previous analyzes. I explore the possibility that the labor market outcomes of the military spouses may be affected by the time that service members spent at home. In particular, I examine how deployments may affect spouses of the military personnel.

This study also contributes to the discussion on the role of different policies that are designed to improve family wellbeing. Because the satisfaction of military spouses may have an effect on personnel retention, the military has incentives to assure that military spouses have the job opportunities and earnings potential that they desire. Many policy makers support policies intended to improve the welfare and financial wellbeing of the military families and spouses. The policies emphasize improving educational opportunities, career choices, child care availability, and job search for spouses. They also include assistance in finding a job, targeted job training, and agreements with local employers.[1] Other policy options include priority placement within DoD for relocated spouses, reciprocal certification agreements with other governmental entities, and internet-based employment websites.[2] Unfortunately, we know relatively little on whether these policies achieve their objectives.

My analysis suggests that deployments reduce spousal labor force participation by 2.8 percentage points. Unlike previous studies that examined the effect of deployments only (Angrist and Johnson, 2000), I also examine whether this deployment effect differs by important household characteristics. I find that deployments have a larger effect on spousal labor force participation in families with small children. This is consistent with a theoretical household utility maximization model in which the response to deployment depends on the relative burden of household duties. The deployment effect also differs based on the expected time that service members are away. While spouses do not respond to deployments shorter than 4 months, I find that spouses reduce their labor force participation if the total length of a deployment is 5 or more months. This is consistent with a theoretical model under which the costs of searching for a new job prevent the spouse from reacting to short deployments. In addition, I find that spouses reduce their labor supply before service members are deployed. The spouses may react to an increase in the burden of household duties since the service members spend most of their time on base preparing for a deployment.

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[1] See for example, Shellenbarger (2005).
[2] For description of the various state level policies and initiatives see http://www.ncsl.org/

The spouses may also take some time to return to the labor force after the service members return from the deployment.

I find that deployments are positively related to reenlistment. Those service members who were deployed since September 11, 2001 are 2.7 percent more likely to reenlist (sign a new contract of over 24 months after their current contract expires) than those who were not deployed. Deployed service members are about 4 percentage points less likely to leave the military after the end of their current contract than those service members who were not deployed.

These results suggest that deployments have a different effect on spousal labor supply than on reenlistment behavior. Even though deployments reduce spousal labor force participation, they tend to increase service member's likelihood of staying in the military. This pattern of results suggests that the spouses reduce their labor supply in order to maximize their household wellbeing. In other words, they may not have to work as much since deployments increase household earnings, and allows spouses to purchase more of the household good on the market. We may also interpret the absence of an adverse deployment effect on household wellbeing as the evidence of the effectiveness of many other policies that the military has to improve household wellbeing during deployments. This effect may also reflect the additional resources that the military spends on assuring high level of reenlistment among those service members who were deployed and gained experience that the military may want to use in the future.

I also find evidence of the selective separation from the military based on spousal taste for employment. My analysis finds a negative correlation between spousal labor force participation and service member's reenlistment, especially among the first term enlisted personnel. In particular, service members are less likely to stay in the military at the end of the enlistment term if their spouses are in labor force. These results are consistent with the exit from the military based on the spousal taste for employment. Those spouses who have a high taste for a career and perceive that military life may impose constraints on their career opportunities will encourage service members to leave the military as soon as possible. As a result, the families who have been in the military for a while are a selected sample, since they have already chosen to reenlist. Over time they have learned about the military life and they may be the ones who are better accustomed to the hardships that the

military life imposes on families.

7.2 Future Analysis

This dissertation examines only one aspect of the time constraints that the military imposes of families. Although deployments are the most important determinants of how much time a service member spends away from home, factors other than deployments may be important too. For instance, service members often spend time away from home on individual or unit training, or work long and irregular hours when they have to perform their duties on the base overtime. Future analysis should consider the effects of those factors on such family outcomes as labor supply, household wellbeing, and marital stability. An important part of the military experience is that service members may have very little leverage over their work schedules. This suggests that it is possible to estimate the causal effect of the military schedules on the different outcomes of interest.

Future analysis should also consider other outcomes that may be important to military families. For instance, additional analysis of the spousal labor supply should consider not only the labor force participation decision but also the spousal hours of work and earnings. Since the exit from the labor labor force is an extreme outcome, some spouses may respond to deployments by simply reducing their work hours, or shifting to jobs with more flexible schedules. My future research will use spousal earnings as a proxy for hours of work to explore this effect.

Future analysis should also reexamine the relationship between spousal employment and reenlistment behavior. One of the ideas suggested by the analysis in this dissertation is that reenlistment behavior may be driven by spousal career opportunities. As a result, those spouses who have better career opportunities outside the military would be more likely to leave the military. If this is true, one would expect that spousal earnings would improve for those families who just separated from the military. One way to test this hypothesis is to examine change in spousal earnings after the service member leaves the military. At the same time, those spouses who stay in the military may have a lower taste for work, or a higher preference to spending time in home production, thus the differences may be driven not by the effects of the military but by the preferences for work at home and at the market.

Furthermore, the effect would be different based on the length of exposure to the military life. Those spouses who believe that they would be negatively affected by the military life would encourage service members to separate from the military as early as possible.

Future analysis should also consider the long term effects of deployments on the families of the military personnel. While this analysis examines a short term response to deployments, long term responses of service members and the family members are also interesting. The stress of extended deployments to combat zones may affect long term labor market prospects of service members after they leave the military. The long parental absences may also have a long lasting effect on the children's labor market outcomes throughout their career.

Appendices

Appendix A

Household Utility Model without Home Production

A.1 Set Up

Consider a model in which household members are making trade-offs between the consumption of goods and the consumption of leisure (defined as the time not spent at work). Suppose that household preferences can be represented by a single utility function, $U = U(f, m, y, d)$.[1] A family receives utility from money income, y, wife's leisure, f, and service member's time that he spends with the family, m, and service member's time on deployment, d.[2] It is unusual that deployment is a direct source of utility. This extension allows me to consider a possibility that service members may receive a direct utility from some aspects of deployments. For instance, some service members may enjoy the ability to apply their training to a real world situation, others may value the benefits to their career, and yet other service members may enjoy the deployments as an opportunity to get away from the routine of a military base.

Note that military families represent a special type of families in which a service member is always employed (while in the military) and a spouse faces a decision of whether to seek employment or not. Suppose for now that I am interested in households in which a husband is in the military and a wife is in the civilian market. The spouse decides how much to work

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[1]Suppose this utility function is quasi-concave. $U_f > 0$, $U_m > 0$, $U_y > 0$, $U_{ff} < 0$, $U_{mm} < 0$, $U_{yy} < 0$.

[2]The preferences may differ between families, although they are assumed to depend on the same set of factors.

depending on the time the service member spends with the family. Time that the service member spends at home may depend on the deployment time and the number of hours worked overtime, $m = g(d, h_m)$. I take into account the length of time that the service member is deployed rather than a specific instance of deployment. This model allows us to think about decisions that military families make over the course of a year or even several years. An alternative model would examine decisions of service members over the short period of time, when a deployment could be represented by an indicator variable. I also assume that the soldier's work hours are exogenous, since they are driven mostly by the military's demands.

In this simple model a spouse chooses how many hours to devote to market work to maximize a household utility given the budget and time constraints that the household faces:

$$\text{max} \quad U(f, m, y, d) \tag{A.1}$$
$$\text{s.t.} \quad y = wh_f + b + dv + R$$
$$T = f + h_f$$
$$T = m + h_m + d$$

where, w is a wage that the wife receives for working h_f hours, b is basic pay, vd is deployment pay, and R stands for income from other sources. In this model, the service member receives basic pay, and it does not depend on the service member's hours of work. The spouse treats service member's deployments and work hours as exogenous, which suggests that the only choice variable in this model is wife's work hours, h_f. Note that deployments affect service member's leisure time that he or she spends with the family, utility directly, and income via deployment pay. Hours of work, however, are not compensated in this model, which reflects realities of military pay system.

I can express this maximization problem in terms of the spouse's work hours:

$$\max_{h_f} U(f, m, y, d) = U(1 - h_f, 1 - h_m - d, wh_f + b + vd + R, d) \tag{A.2}$$

Assuming an interior solution, I write down the first order condition as:

$$\frac{\partial U}{\partial h_f} = -U_f + wU_y = 0 \tag{A.3}$$

The second order condition for this problem is:

$$\frac{\partial^2 U}{\partial h_f^2} = U_{ff} - wU_{fy} - wU_{yf} + w^2 U_{yy} = U_{ff} - 2wU_{fy} + w^2 U_{yy} < 0 \tag{A.4}$$

which should be negative to assure that the solution to the problem (A.2) is a point of maximum. Also note that because of the symmetry, $U_{fy} = U_{yf}$.

The first order condition (A.3) suggests that the spouse chooses hours of work so that the marginal costs of working an additional hour (foregoing an hour of leisure) is equal to the marginal benefits from the additional income received as a result of supplying more labor. One can use (A.3) to derive the spousal optimal labor supply as a function of exogenous variables in the model: $h_f^* = h_f^*(w_f, d, v, b, h_m, R)$.[3]

A.2   Comparative Statics for Spousal Labor Supply

An objective of this theoretical exercise is to provide predictions about a possible effect of changing the exogenous factors on the spousal hours of work and on utility. Some of these factors have attracted a lot of attention of policy makers recently. For instance, I am interested in how deployment time may affect wife's hours of work. To derive these predictions I totally differentiate the first order condition (A.3) with respect to an exogenous variable d, and solve for $\partial h_f / \partial d$. The total derivative of (A.3) with respect to d is:

$$-\left(-U_{ff}\frac{\partial h_f}{\partial d} - U_{fm} + wU_{fy}\frac{\partial h_f}{\partial d} + vU_{fy} + U_{fd}\right) \quad +$$
$$+w\left(-U_{yf}\frac{\partial h_f}{\partial d} - U_{ym} + wU_{yy}\frac{\partial h_f}{\partial d} + vU_{yy} + U_{yd}\right) \quad = \quad 0 \tag{A.5}$$

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[3]Note that it is also possible that maximization produces a corner solution. In other words, the spouse is better off not working at all. In this case, the first order condition is: $\frac{\partial U}{\partial h_f} = wU_y - U_f < 0$. Allowing for a possibility of a corner solution, the spouse hours of work can be written as: $h_f = h_f(w_1, d, v, b, h_m, R)$ if $h_f() > 0$ and $h_f = 0$ otherwise.

Rearrange (A.5) to solve for $\partial h_f / \partial d$:

$$\frac{\partial h_f}{\partial d} = \frac{-U_{fm} + wU_{ym} + vU_{fy} - vwU_{yy} + U_{fd} - U_{yd}}{U_{ff} - wU_{fy} - wU_{yf} + w^2 U_{yy}} \tag{A.6}$$

Even though the denominator of the expression (A.6) is negative (from equation A.4), an overall effect of deployment on the spousal labor supply is ambiguous. The specific effect depends on the relative size of the different cross–partial derivatives that enter the nominator of equation (A.6). The first two cross–partial effects that enter the nominator of the equation (A.6) reveal how the marginal decision of the family changes in response to changes in the time that service members spend at home $(-U_{fm} + wU_{ym})$. Part of the response depends on how members of the household value their joint time at home. If the time at home for both spouses are complements (in other words, the spouse enjoys her time at home more when the service member is around), the spouse will increase her labor supply in response to a deployment. If, however, the time that spouses spend at home are substitutes, deployments would lead to a decrease in the spousal labor supply. The response to deployments depends also on how the marginal effect of income changes with the change in the time that service members spend at home (U_{ym}). This cross–partial effect is positive if we believe that the utility from income is increasing in the time that service members spend at home, or that the service members time at home and income (or consumption of all goods that income can purchase) are complements.

The marginal response of the spouse to deployments also depends on specific assumptions about the role of income in the utility functions, represented by $vU_{fy} - vwU_{yy}$ in equation (A.6). The U_{yy} is negative because of the assumption of quasi-concavity. The cross–partial effect of the spouse's own leisure time and household earnings (U_{fy}) may be positive or negative. This effect is positive if we believe that the marginal enjoyment from the spouse's labor increases when the earnings in the household are higher. This cross–partial effect, however, is negative if an additional time at home adds less to the utility with an increase in household income.

The final margin that determines the response to deployments in equation (A.6) depends on how deployment time relates to the spouse's own leisure time and earnings $(U_{fd} - U_{yd})$. If one assumes that marginal utility from the spouse's own leisure and marginal utility of
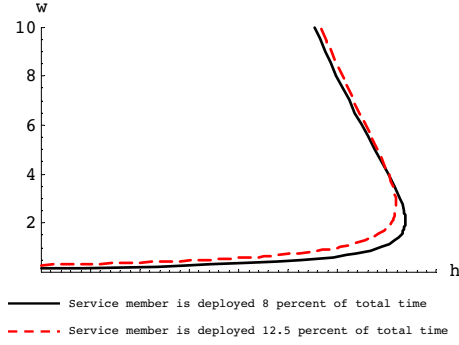
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Figure A.1: Effect of an Increase in Service Members's Deployment Time on Spousal Labor Supply

consumption is decreasing in deployment time, the overall contribution of this margin to the equation (A.6) would be ambiguous.

I use a specific example to illustrate how deployment length may affect spousal labor supply. Suppose that household preferences can be represented by a quadratic utility function in the form $U = v'Av + b'v$, where $v = (f, m, y, d)$, A is a 4 by 4 symmetric matrix of coefficients, and b is a 1 by 4 coefficients vector. This model is flexible enough to approximate a variety of utility functions. Figure A.1 illustrates the effects of an increase in deployment length on spousal labor supply.[4] A solid line in the figure depicts an initial labor supply derived from the utility maximization model. This labor supply has the usual characteristics. First, at some level of wages spouses decide not to participate at the market at all. At higher level of wages spouses increase their hours of work as response to wages. But after some point, an increase in wages leads to a reduction of hours of work. This is a so-called backward bending labor supply curve. An increase in deployment time makes the spouse to adjust her work hours. A dashed line in the figure A.1 denotes how labor supply changes when a service member spends 12.5 percent of total time endowment on deployment. I notice several effects on this graph. First, an increase in deployments leads to higher reservation wage. In addition, the spouse may increase or decrease her hours of work depending on wages.

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[4]This figure assumes the following parameters of the utility function: $a_{11} = -.6$, $a_{13} = 3$, $a_{33} = -.4$, $a_{12} = -8$, $a_{23} = -2$, $a_{34} = 1$, $a_{14} = -4$, $a_{22} = -2.2$, $a_{24} = -.5$, $a_{44} = -.5$, $b_1 = 70$, $b_2 = 80$, $b_3 = 50$, $b_4 = 10$ $T = 24$, $h_m = 9$, $v = 1$, $b = 30$, and d increases from 2 to 3, or from 8 to 12.5 percent of time.

I derive the effects of other exogenous variables on the spouse's work hours in the similar fashion:

$$\frac{\partial h_f}{\partial h_m} = \frac{-U_{fm} + wU_{ym}}{U_{ff} - wU_{fy} - wU_{yf} + w^2 U_{yy}} \tag{A.7}$$

$$\frac{\partial h_f}{\partial b} = \frac{U_{fy} - wU_{yy}}{U_{ff} - wU_{fy} - wU_{yf} + w^2 U_{yy}} \tag{A.8}$$

$$\frac{\partial h_f}{\partial v} = \frac{dU_{fy} - wdU_{yy}}{U_{ff} - wU_{fy} - wU_{yf} + w^2 U_{yy}} \tag{A.9}$$

Comparative statics in equation (A.7) describe a change in the spousal labor supply in response to a change in service member's work hours. Intuitively, an increase in the service member's work hours reduces the amount of leisure he can spend with the family. Note that the response depends on the first margin discussed in equation (A.6). In particular, the response of a spouse depends on how the spousal leisure time relates to other goods in this economy. If, for example, service member's and spouse's leisure times are complementary, then an increase in service member's work hours would lead to an increase in the spousal work hours. Without a specific assumption about the cross-partial derivatives in the nominator of equation (A.7), we can not sign the effect of the service member's work hours on the spousal labor supply. Depending on a specific assumption about the utility function and on the level of wages this effect may be positive or negative, replicating the relationship depicted in Figure A.1 but for an increase in the service member's hours of work.

Comparative statics in equations (A.8) and (A.9) illustrate a response of the spousal labor supply to the changes in the service member's base pay or to the changes in a deployment pay. These effects depend only on the sign U_{yf}.[5] If $U_{yf} > 0$, then an increase in deployment pay or basic pay leads spouses to reduce their hours of work (remember that the denominator of equations (A.8) and (A.8) is negative to satisfy condition A.4). The same holds if $U_{yy} < U_{yf} < 0$. Note that the effects of pay are the same with the only difference that the effect in equation (A.9) is the effect in equation (A.8) multiplied by d.

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[5]$U_{yy} < 0$ from the assumption of concavity.

A.3   Effect of Deployment on Retention

I derive predictions about the effects of deployment, service members work hours, and pay on household utility using the envelope theorem. In particular, the envelop theorem suggest that for small changes in exogenous variables (d), $\mathrm{d}U^*/\mathrm{d}d$ can be computed by holding h_f constant *at its optimal value* and simply calculating $\partial U/\partial d$ from the objective function directly. The partial derivatives of the objective function (A.2) with respect to all exogenous variables are:

$$\frac{\partial U}{\partial d} = -U_m + vU_y + U_d \tag{A.10}$$

$$\frac{\partial U}{\partial h_m} = -U_m \tag{A.11}$$

$$\frac{\partial U}{\partial w_f} = h^*U_y \tag{A.12}$$

$$\frac{\partial U}{\partial b} = U_y \tag{A.13}$$

$$\frac{\partial U}{\partial v} = dU_y \tag{A.14}$$

Equation (A.10) suggests that a theoretical effect of deployment on household wellbeing is ambiguous. First, deployments reduce time that a service member spends with the family. Since both deployment time and work hours are exogenous to the service member, the only way for the service member to respond to an increase in deployment is to reduce leisure time at home. This leads to a lower household wellbeing. Second, deployments increase household wellbeing due to an increase in income. When on deployment, household earnings increase. Third, deployments may lead to a change in the household wellbeing since many service members may receive a direct satisfaction from the deployment. The resulting overall effect depends on the relative strength of each of the factors. When a marginal disutility of reduced leisure dominates two other effects, the overall effects would be negative.

The literature supports the hypothesis that some deployments may increase utility and reenlistment. Service members may value a possibility to focus on performing duties directly related to their mission rather than on non-job related tasks (Huffman et al., 2000); value chances to apply their skills, leadership and other professional opportunities (Huffman et al., 2001); experience higher job satisfaction from performing peacekeeping tasks (Adler, 2000). Other studies have found that specific types of a deployment experience in specific groups
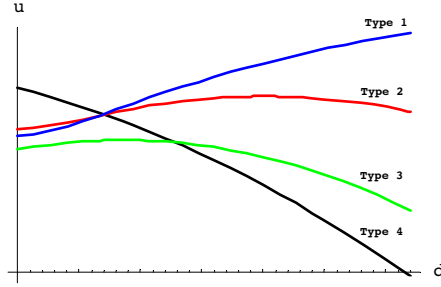
101

Figure A.2: Illustrative Preferences for Deployment Time

of service members may lead to the lower reenlistment rates. For the review of the relevant articles on the effect of deployment on reenlistment see Hosek et al. (2006, p.11-14) and Wisecarver et al. (2006), and Swan et al. (2002).

Hosek et al. (2006) interprets the relationship between utility and deployment as if the military families have preferences over deployment length. In fact the families may differ in their preferred deployment time. Some households may receive high satisfaction from deployments, others may not like deployments, and may prefer that service members spend most of the time at home base. Figure A.2 depicts several types of households with the different preferred deployment time. Some families would prefer the service member to be deployed for longer, other households would prefer relatively short periods of deployment. Type 2 and type 3 households may represent the majority of the military households. They prefer some deployment to none.

Equations (A.10) and (A.11) suggest that different types of work related absences from home have different effects on family wellbeing. While the effect of deployments on family wellbeing in ambiguous, the effect of service members' work hours on family wellbeing is negative. Similar to deployments, an increase in service members' work hours reduces the time they can spend with their families. This leads to a decrease in the family wellbeing. Unlike deployments, however, an increase in service member's work hours does not lead to an increase in earnings and does does not provide a direct utility. The model discussed in this section assumes that service members receive a direct utility from being deployed. For example, service members may like deployments as a way to use their skills and training.

This factor may sometimes outweigh the utility costs of reduced leisure with the family.

The model presented here ignores a possibility that long work hours may have a positive effects on individual utility. For example, workers may receive an intrinsic motivation from the importance of their job to a community or to their country. In addition, workers may interpret their work hours not as a conflict with the family time but as their direct role in providing for the family (Milkie and Peltola, 1999). In the military, the effect of long work hours may vary between service member depending on reasons for long hours and the way the view them. They may be less satisfied if they feel overwhelmed with their hours and they feel like they are doing job not connected to their mission. Other may believe that the overtime work is very important for the overall mission.

Comparative statics in equations (A.12) through (A.14) suggest that an increase in the spouse's wage rate unambiguously increases household wellbeing, as does an increase in basic pay of deployment pay rate. This is consistent with the literature that suggests that compensation for deployment can make up for negative effects of deployment on reenlistment. For example, Golding and Griffis (2003) found that an increase in Sea Pay in 1981 was associated with a 58 percent increase in tour extensions that year.

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